

FLIGHT

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AND AIRSHIPS

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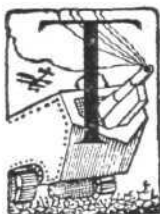
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EDITORIAL COMMENT



TWO years have passed since the air defence of London was last tested by exercises on a grand scale. In 1929 there were no exercises, and last year the exercises took the form of a war between the North and the South of the country. This last scheme gave ample opportunity to the commanders to show their ingenuity and their power of improvisation. Such schemes should be of great assistance to Air Officers in preparing for a war overseas, but they hardly touch upon the specific reason for which the command Air Defence of Great Britain exists. During the last two years it is reasonable to suppose that considerable progress has been made in elaborating the scheme for defending London from air attack. We hope that the Corps of Observers, which is the pivot of the whole scheme, has increased in numbers and has been improved in training, in organisation, and in technical equipment. It would be hard to give too high praise to those volunteers who enrol in the Observer Corps, with the status of special constables, in order to play a most important part in the defence of the country. They work more or less in secret. The public has no opportunity of seeing them or their work. Presumably in time of war they would have a uniform, but in peace time they wear ordinary mufti clothes. They carry no colours, perform no ceremonial parades in the presence of Royalty, and in fact dispense with most of the appurtenances which help to attract the Territorial soldier. But if the observers round the coast fail, their failure may let a squadron of enemy bombers through the defence into the London area, and cause the destruction of an arsenal or some other important target. The men who do this quiet, all-important work deserve the highest honour from the community.

The Observer Corps, we may take it, has made progress in the last two years. We may be equally certain that the anti-aircraft guns and the searchlights have not stood still. We know that the Royal Air Force has made progress. A number at least of the squadrons of A.D.G.B. are now equipped with up-to-date aeroplanes. Obviously the time was ripe

DIARY OF CURRENT AND FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list:—

1931

July 25. King's Cup Race.

July 25-30. Conference on Medical Utility of Aviation in the Colonies, at International Colonial Exhibition, Paris.

July 25-Aug. 9. Rhon Gliding Competitions, Germany.

July 27-28. Cricket. R.A.F. v. Free Foresters at Camberley.

Aug. 1-2-3. Southdown Skysailing Club's Annual Flying Meeting.

Aug. 3-4. Cricket. R.A.F. v. R.N. at Halton.

Aug. 15. Scarborough Ae.C. Air Pageant.

Aug. 15. Manchester-Liverpool Inter-City Race.

Aug. 22. Newcastle-on-Tyne Meeting.

Aug. 29-Sept. 5. Boulogne Air Week.

Aug. 29-Sept. 7. U.S. National Air Races, Cleveland, Ohio.

Sept. 5. Norfolk and Norwich Ae.C. Display at Yarmouth.

Sept. 5. Haldon Flying Meeting.

Sept. 12. Schneider Trophy Contest.

Sept. 23-Oct. 11. French Two-Seater Light 'Plane Competition.

Sept. 26. Garden Party, Bristol and Wessex Ae.C.

to make a further test of the defences. This progress, however, brings its own penalties from a Press point of view. It is thought undesirable that details should be made public of how the information about the approach of raids is collected and passed on. The general scheme of the defence is no secret. Observers round the coast first become aware of the approach of a raid. They may either see it or hear it or both. They have instruments, which are constantly being improved, which give them a pretty accurate idea of the position and direction of the raiding bombers. Their reports are passed on speedily to certain centres, and in a very short space of time the information is at the disposal of the Air Officer Commanding the Fighting Area. In peace time, as the Air Force List informs everybody, his headquarters are at Uxbridge. In time of war they may be somewhere else. From the various reports which come in he is able to trace the course of the raid, and can warn the various defence units which will have to deal with it. Certain groups of guns will be warned, and if the raid comes by night, the searchlights concerned will also receive a warning. The fighter squadrons in the sectors which the raid is about to pass over are ordered into the air. Of course, the effectiveness of these measures depends upon the earliness of the information. Celerity in reporting a raid is the most important point, for modern day bombers make very high air speed with their full load of bombs. The next most important point is that the fighters should be able to get quickly up to the height at which the bombers are coming in. Finally, the performance and armament of the fighters must be such that they can reckon on having the best of the fight with the bombers when they have engaged them. Up to the moment when the battle is joined, the advantage of the initiative lies with the invaders. The A.O.C. Wessex Bombing Area can choose when and where he will send his squadrons in, and can lay down the objectives which they are to attack. But when the fighters get to grips with the bombers, then the tactical advantage passes to the defence. The bombers must hold their course, trusting to their formation and the cross-fire of their machine guns to protect them. The bombers are tied by this necessity. The fighters have a free hand to choose the best method of attacking the formation. The fighters are inferior in gun power, at least the single-seater fighters are, but they make up for this by speed and manoeuvrability. They may suffer casualties, which are always to be expected in war, but they have reason to hope that they will take such heavy toll of the bombers that the raid will be a failure, and that the particular bomber squadron which they have mauled will be out of action for a considerable time. It is never claimed that any system will entirely prevent hostile bombers from getting through, but it is confidently expected that raiding can be made such an expensive affair that any enemy will soon have to abandon it. That was achieved by the defence in 1918, and the organisation (when properly developed) can be made far more effective now than it was then. One point of defence which is not allowed for in these exercises is the bombing of hostile aerodromes by

our own bomber squadrons. That may well be the most effective measure of all, but for this week's work it is not taken into account. We look for quicker reporting than ever before, for if the reporting is not very prompt the "Harts" will be through the defences before any effective steps can be taken to deal with them. We look to see the new fighters able to deal with even the fastest bombers, provided that the news comes in smartly, and to overwhelm utterly the slower types. Though the reporting will not, we hope, be slow, still we look to the "Fury" to catch raiders on the very shortest of warnings. Everyone is anxious to see whether the flight of No. 23 (Fighter) Squadron, which flies "Hart" fighters, will herald a return of the two-seater fighters. It is questions like these which promise to make these exercises particularly interesting.

One really novel experiment is being tried. Four squadrons are allotted to the defence as friendly bombers. They are not intended to do any actual bombing, and so add nothing to the strength of the defence. They will, however, start off for the coast as if on raids. Doubtless, they will be seen by observers, and their progress will be reported to the Defence Headquarters. What it is desired to test is whether the defence will be able to identify the friendly bombers or whether it will mistake them for the enemy and send up fighter squadrons to intercept them as they make for the coast. Of course, there is no fear that the fighters will actually open fire at friendly machines, for when the pilots get near they will be able to recognise the "Atlas," the "Dart" and the "Hyderabad," and will know that the enemy has no machines of any of those types. At least, we take it for granted that, with the help of the searchlights, the fighter pilots will be able to distinguish between the Lion engines of the "Hyderabad" and the Jupiters of the "Hinaidi." In the case of foreign bombers, there would be no possibility of mistake. The actual combat, however, matters little. The point is to see whether any fighters are ordered up in error, for if they are the defence will have wasted the time and energies of a squadron, both of which are very valuable and should not be squandered.

Up to the time of going to press not very much can be deduced from the early operations. On Monday evening, when the exercises started, the weather was so bad that the day bombers were mostly unable to reach their objectives. This does not prove that they would have been unable to do so in actual war. But risks must not be run on peace manoeuvres. Flying through clouds in formation is not encouraged, while, on the other hand, the bombers (in fact, all the aircraft) are not allowed to fly below 5,000 feet when within 10 miles of Charing Cross. On their first raid, both the squadrons of "Harts" were forced down by clouds to 2,000 feet in the neighbourhood of Horsham, and, therefore, abandoned their raids. Since then the weather has somewhat improved, and the rest of the week will, we hope, give ample opportunities to see how our expectations work out in practice.

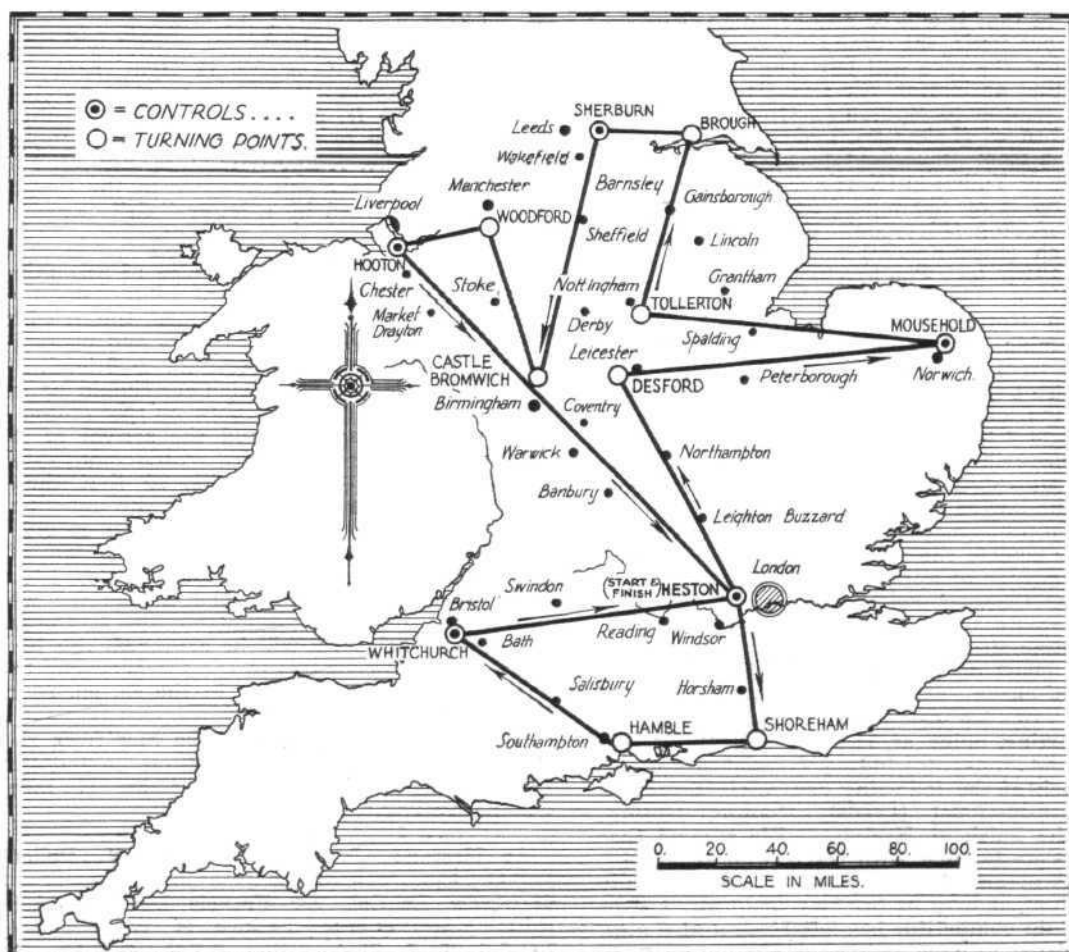




KING'S CUP RACE 1931

41 machines have been entered for the air race around Britain for the King's Cup, which starts and finishes at Heston Air Park, London, tomorrow, Saturday, July 25. The total distance to be covered is 982.5 miles. There are five controls, at each of which compulsory stops of 40 minutes have to be made, and machines will not be handicapped at speeds below 100 m.p.h.

The machines entered are of the following types:—Arrow "Active," 1. Avro "Avian," 5. Blackburn "Bluebird," 5. Civilian "Coupe," 1. Comper "Swift," 1. Curtiss-Reid "Rambler," 1. De Havilland "Gipsy-Moth," 12. De Havilland "Puss Moth," 5. Southern "Martlet," 2. Spartan, 4. Westland "Widgeon," 4.



THE KING'S CUP AIR RACE

Organised by the Royal Aero Club under F.A.I. Regulations

COMPARED with last year's list of entries for the Challenge Cup presented by His Majesty the King for an air race around Britain, this year's entries list can only be termed disappointing. Last year 101 machines were entered, 88 started and 60 finished. This year there are but 41 entries.

In the main, the smaller number of entries can be put down to two causes. The Royal Aero Club decided to limit entrants and pilots of machines in the 1931 race to persons of amateur status, *i.e.*, persons not connected in any way in a professional capacity with any aircraft or aero-engine firm. That at once ruled out many who would otherwise have appeared in this year's race. The second cause contributing to the reduced number of entries is the decision not to handicap any machines at a speed lower than 100 m.p.h. This regulation has ruled out several aircraft types suitable for the private owner.

Curiously enough, the machine of which the greatest number (10) has been entered this year is the Gipsy I engined Moth. In last year's race for the King's Cup a few of these machines managed to exceed 100 m.p.h. by a very small margin, but quite a few fell below this speed. It would be curious if quite a large percentage of the Moth (Gipsy I) machines this year go around the course at 99.9 m.p.h., only to be ruled out after completing the course. Possibly the intention is to interpret this rule to mean machines which, in the estimate of the handicappers, are capable of 100 m.p.h.

Yet another result, if only somewhat indirect, of the "amateur status" decision is that but very few new types have been produced for the King's Cup Race. Manufacturers, knowing that they were debarred from entering machines themselves, hesitated, very naturally, to go to the trouble of producing new types for the race. Any firm which was contemplating the marketing of a new model would, had they been permitted to enter, have made an effort to get one or two of the new machines into the race. As it is, they have decided to take their time and develop the new type at their leisure. Taking it all round, it will scarcely be denied that the Royal Aero Club has acted unwisely in introducing the "amateur status" regulation, and it is to be hoped that it will be dropped next year.

Concerning the race itself, this year's course is one totaling 982.5 miles, and the race will be flown in six stages, starting and finishing at Heston Air Park, London. The first stage is from Heston to Mousehold (Norwich), with a turning point at Desford (Leicester), and is of 196½ miles. The second stage is from Mousehold to Sherburn (Leeds), with turning points at Tollerton (Nottingham) and Brough, East Yorkshire, and is of 189 miles. The third stage is from Sherburn to Hooton (Liverpool), with turning points at Castle Bromwich (Birmingham) and Woodford (Manchester), and is of 181 miles. The fourth stage is a non-stop one of 165 miles direct from Hooton back to Heston. The fifth stage is from Heston to Whitchurch (Bristol), via Shoreham and Hamble, and is of 156½ miles. The sixth and final stage is from Whitchurch to Heston and is of 94½ miles. At each of the controls mentioned, competitors have to make compulsory stops of 40 min., which for the five controls will add 3 hr. 20 min. to the flying time.

The first machines will leave Heston at 6 a.m., and, as no machine is handicapped below 100 m.p.h., that figure may be taken as the lowest in the race. With the stops at controls, a 100-m.p.h. machine will, therefore, take 13 hr. 10 min. to complete the course, so that the finish at Heston should take place at approximately 7 p.m.

In order to assist those of our readers who desire to be able to work out rapidly and with a fair degree of accuracy the speed of any competitor whose flying time is known, we have prepared the chart on page 713. On this chart will be found a series of curves, each curve representing one or more of the stages. In each instance we have calculated the time from the starting point at Heston, and the curves give the speeds and times (including compulsory stops) from Heston to each of the following controls: Mousehold (Norwich), Sherburn-in-Elmet (Leeds), Hooton, Heston, Whitchurch and the finish at Heston. We assume that most of our readers are familiar with the reading of graphs, but for the benefit of any who may not know the really very simple procedure, it may be briefly explained. Let us suppose that a certain competitor has left Heston at 8 a.m. and that he is reported to have arrived at Hooton at 13.42 (1 hr. 42 min. p.m.). Then, obviously, his lapsed time is

13.42 - 8 = 5 hr. 42 min. Looking up on the chart 5 hr. 42 min., follow the line across until it cuts the curve for Heston-Hooton. From this point read down to the speed scale, and it will be found that the horizontal line meets the speed scale at 130 m.p.h., which is, therefore, the speed this particular competitor has averaged from Heston to Hooton, taking into account the compulsory stops en route.

On the other hand, if the speed of a certain machine is known, and it is desired to find out at what time he should arrive at any particular control, this can also be readily done by the aid of the chart. Let us assume that a machine has a known speed of 120 m.p.h., and that it left Heston at 8.15 a.m. If it is desired to know at what time the machine will reach Sherburn-in-Elmet it is only necessary to look up the figure 120 m.p.h. on the speed scale, and from this trace upwards a vertical line to the Heston-Sherburn curve. From the point at which the vertical from 120 m.p.h. cuts this curve, look along to the time scale, which will be found to be intersected at 3 hr. 53 min. This, therefore, is the lapsed time of that particular machine over that particular distance, allowing for stops. The machine left Heston at 8.15 a.m. and uses 3 hr. 53 min. in getting to Sherburn. Obviously, therefore, it will arrive at 8.15 + 3.53, or 12.08 (8 min. past 12). Similarly, it is found from the chart that at a speed of 140 m.p.h. a machine takes 3 hr. 26 min. to get to Sherburn, and to find his time of arrival it is only necessary to add 3 hr. 26 min. to his starting time.

At the Turning Points

Competitors are required to pass all turning points at a distance not exceeding 300 ft. and at a height not exceeding 500 ft. The actual turning point is marked by a white cross, and to assist competitors in identifying it, a bell tent will be placed close to the white cross.

At the following turning points competitors must leave the white cross on their left: Brough and Woodford. At the other turning points, *i.e.*, Desford, Tollerton, Castle Bromwich, Shoreham and Hamble, competitors must leave the cross on their right.

At the Controls

The time of arrival at each control will be taken at the moment the aircraft passes, in flight, between two arrows on the aerodrome. Machines must cross the line at not more than 500 ft. altitude, and the line must be crossed in the direction in which the arrows are pointing. After crossing the line, competitors must turn left and land. The official control tent will be close to the refuelling station, and will be marked by a letter "C."

At Heston

Heston will be the great centre of attraction, since not only is it the starting and finishing point, but is also one of the intermediate controls, the machines arriving from Hooton having to land there and make a compulsory stop of 40 min. before proceeding to Bristol, via Shoreham and Hamble. The first machines should be arriving from 3 p.m. onwards. The gap between the scratch man leaving Heston in the morning and the arrival of the first man from Hooton will be occupied with demonstration and exhibition flights of various sorts, so that there should be something for the public to watch throughout the day.

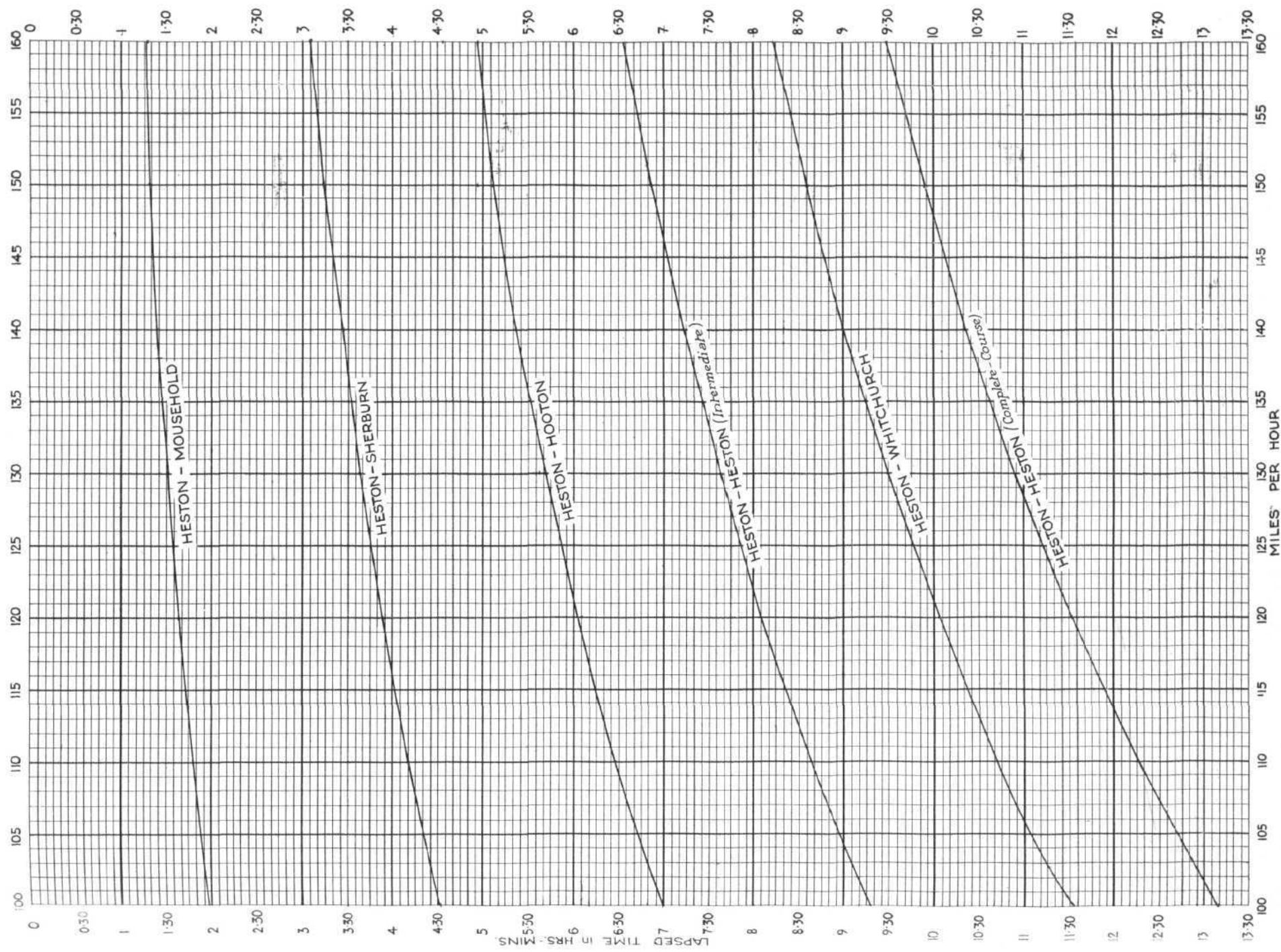
Preparations are being made for a record attendance, and the organisation of enclosures and sale of tickets are being carried out by Keith Prowse & Co., Ltd. There will be a members' enclosure, the tickets for which will be priced 10s., the tickets admitting also to the aircraft park. Two other enclosures will be arranged, one at 5s. and the other at 1s. For visitors to the 10s. enclosure there will be a 5s. car park, and for those in the 5s. enclosure there will be a 1s. car park.

Visitors who wish to view the race from their cars will be able to reserve parking positions around the aerodrome boundary at an inclusive price of 25s. No outside parking will be available.

Officials

At Heston:—*Judge:* Colonel R. V. Pollock, C.B.E., D.S.O., Chairman of the Household Brigade Flying Club. *Stewards:* Lt.-Col. Sir Francis McClean, A.F.C., Major R. H. Mayo, O.B.E., Lt.-Col. H. W. S. Outram, C.B.E., Lt.-Col. F. C. Shelmerdine, C.I.E., O.B.E. *Clerks of the Course:* Squadron Leader T. H. England and Squadron

SPEEDS AND TIMES



GRAPH FOR FINDING SPEEDS OVER KING'S CUP COURSE: The curves connect lapsed times and flying speeds, i.e., include the time spent in the various compulsory controls. (FLIGHT Copyright.)

FLIGHT, JULY 24, 1931

Leader R. A. de Haga Haig. *Handicappers:* Captain W. Dancy and Mr. F. Rowarth. *Timekeepers and Starters:* Colonel F. Lindsay Lloyd, C.M.G. C.B.E., and Mr. A. G. Reynolds. *Chief Marshal:* Mr. F. E. N. St. Barbe. *Press Steward:* Mr. F. H. Jones.

Timekeepers at the Controls

At Mousehold (Norwich): Mr. F. T. Bidlake, Mr. A. J. M. Ivison and Mr. G. A. M. Garland. At Sherburn (Leeds): Mr. F. Fattorini and Mr. J. Woodhouse. At Hooton: Mr. H. N. Ellis and Mr. L. H. Lumby. At Whitchurch (Bristol): Lt.-Col. A. H. Loughborough, Mr. R. A. Dutton, and Mr. T. D. Dutton.

Arrival at Controls

It is, of course, impossible to forecast accurately the times of arrival of competitors at the various controls, as so much will depend upon weather conditions. As a rough guide, however, it may be stated that first machines should arrive very approximately at the following times:

At Mousehold (Norwich): 8 a.m.
At Sherburn (Leeds): 10.30 a.m.
At Hooton: 1 p.m.
At Heston (London): 3.15 p.m.
At Whitchurch (Bristol): 5.30 p.m.
At Heston (Finish) 7 p.m.

LIST OF ENTRIES FOR KING'S CUP AIR RACE

Racing No.	Registration Letters	Entrant	Pilot	Aircraft	Engine	Handicap Allowance	Starting Time
1	EBRO	Sqd.-Ldr. The Hon. Ralph A. Cochrane, A.F.C.	J. G. Ormston	Westland Widgeon III	Cirrus III	h. m. s. 2 33 13	h. m. s. 6 00 00
2	AATE	Alderman C. Walker	Flt.-Lt. J. Bradbury	Blackburn Bluebird IV	Gipsy I	2 33 13	6 00 00
3	AAGY	F/O. J. F. X. McKenna	F/O. J. F. X. McKenna	Spartan	Cirrus III	2 33 13	6 00 00
4	AAGO	Flt.-Lt. G. H. Stainforth	Sqd.-Ldr. D. V. Carnegie, A.F.C.	Spartan	Cirrus III	2 33 13	6 00 00
5	AAUU	Harald Peake	Sqd.-Ldr. J. W. Woodhouse, D.S.O., M.C.	Blackburn Bluebird IV	Gipsy I	2 33 13	6 00 00
6	AAKC	Miss F. J. Crossley	Miss F. J. Crossley	D.H. Moth	Gipsy I	2 33 13	6 00 00
7	AAFK	Geoffrey Linnell	Flt.-Lt. W. L. Dawson	D. H. Moth	Gipsy I	2 33 13	6 00 00
8	AAEF	T. W. Shipside	T. W. Shipside	D. H. Moth	Gipsy I	2 33 13	6 00 00
9	AARU	F. S. Symondson	F. S. Symondson	D. H. Moth	Gipsy I	2 33 13	6 00 00
10	AAIR	F/O. J. W. Gillan	F/O. J. W. Gillan	Blackburn Bluebird IV	Gipsy I	2 33 13	6 00 00
11	AAJP	John Grierson	John Grierson	D. H. Moth	Gipsy I	2 33 13	6 00 00
12	AAHK	Arthur Franklyn	Arthur Franklyn	Avro Avian IV	Gipsy I	2 33 13	6 00 00
14	AAML	Lieut. C. R. V. Pugh, R.N.	Lieut. C. R. V. Pugh, R.N.	Spartan	Cirrus Hermes II	2 27 22	6 05 51
15	AARI	L. O. Russell	L. O. Russell	D.H. Moth	Gipsy I	2 24 29	6 08 44
16	ABFJ	F/O. V. S. Bowling	F/O. V. S. Bowling	Civilian Coupe	Genet Major I	2 24 29	6 08 44
17	ABAG	T. C. Fawcett	T. C. Fawcett	D.H. Moth	Gipsy I	2 21 38	6 11 35
18	AADE	C. S. Napier	C. S. Napier	Westland Widgeon III	Gipsy I	2 18 48	6 14 25
19	AAHA	Flt.-Lt. F. G. Gibbons, D.F.C.	Flt.-Lt. F. G. Gibbons, D.F.C.	Spartan	Cirrus Hermes II	2 16 00	6 17 13
20	AALE	G. N. Wilson	G. N. Wilson	D.H. Moth	Gipsy I	2 13 14	6 19 59
21	EBRQ	"J. Wellworth"	"J. Wellworth"	Westland Widgeon III	Genet II	2 10 29	6 22 44
22	AAHE	A. C. P. Johnstone	A. C. P. Johnstone	Avro Avian IV	Cirrus III	2 10 29	6 22 44
23	EBWU	Lt. Caspar John, R.N.	Lt. Caspar John, R.N.	Avro Avian IV	Cirrus III	2 10 29	6 22 44
24	ABCG	Fred Gough	Fred Gough	D.H. Moth	Gipsy I	2 05 04	6 28 09
25	AALK	Capt. The Rt. Hon. F. E. Guest, P.C., D.S.O.	Capt. F. E. Guest and Pilot Officer A. D. Selway	D.H. Moth	Gipsy II	2 05 04	6 28 09
26	ABHM	Capt. The Rt. Hon. F. E. Guest, P.C., D.S.O.	Miss Diana H. C. Guest and F/O. Rupert Nash	D.H. Moth	Gipsy II	2 05 04	6 28 09
27	EBRN	H. R. Law	H. R. Law	Westland Widgeon III	Cirrus Hermes II	1 59 46	6 33 27
28	ABBN	The Rt. Hon. Lord Stonehaven, G.C.M.G., D.S.O.	M. L. Bramson	Southern Martlet	Genet II A	1 54 33	6 38 40
29	ABIF	Miss Jean Forbes-Robertson	F/O. H. H. Leech	Southern Martlet	Genet II	1 44 25	6 48 48
30	AAOC	Air Vice-Marshal A. M. Longmore, C.B., D.S.O.	Flt.-Lt. D. F. W. Atcherley	Blackburn Bluebird IV	Cirrus Hermes I	1 39 29	6 53 44
31	AACC	Robert McAlpine	F/O. E. C. T. Edwards	Blackburn Bluebird IV	Cirrus Hermes I	1 39 29	6 53 44
32	ABED	Miss Winifred S. Brown	Miss Winifred S. Brown	Avro Avian Sports	Cirrus Hermes II	1 16 08	7 17 05
33	AAHP	Sqd.-Ldr. James McKelvie	Lord Malcolm Douglas Hamilton	D.H. Moth	Gipsy I	1 11 42	7 21 31
34	AAZF	Capt. Gerard Fane, D.S.C.	Sqd.-Ldr. J. M. Robb, D.S.O., D.F.C.	Comper Swift	Pobjoy R.1	1 03 04	7 30 09
35	CF-ABZ	J. C. Webster	J. C. Webster	Curtiss-Reid Rambler III	Gipsy III	1 03 04	7 30 09
36	ABME	A. J. A. Wallace Barr	Flt.-Lt. E. A. Healy	Avro Avian IV M	Genet Major I	0 54 43	7 38 30
37	ABEH	Miss Peggy Salaman	Lt. Geoffrey Rodd, R.N.	D.H. Puss Moth	Gipsy III	0 40 46	7 52 27
38	ABLS	E. L. Gandar-Dower	A. C. S. Irwin	D.H. Puss Moth	Gipsy III	0 40 46	7 52 27
39	AAVA	The Hon. Lady Bailey	The Hon. Lady Bailey	D.H. Puss Moth	Gipsy III	0 40 46	7 52 27
40	ABIY	L. M. J. Balfour	L. M. J. Balfour	D. H. Puss Moth	Gipsy III	0 36 55	7 56 18
41	AAVE	A. C. M. Jackaman	A. C. M. Jackaman	D.H. Puss Moth	Gipsy III	0 35 01	7 58 12
42	ABIX	C. R. Belling	Flt.-Lt. C. B. Wincott	Arrow Active	Cirrus Hermes II B	Scratch	8 33 13

It is possible that after official inspection by the handicappers some slight changes in the handicap allowances may be made.

THE COMPETITORS

In previous years it has been our custom to publish brief descriptions of the aircraft taking part in the King's Cup Race. This year all the competing types, with but two exceptions, are already well known to our readers. These are the Curtiss-Reid Rambler III (Gipsy III) and the Arrow "Active" (Hermes II B). The "Rambler" was described and illustrated in our issue of June 19, 1931, and a description of the "Active" appears in the present issue.

The machines being well-known, but many of the pilots taking part being to some extent "strangers" to many of our readers, we have endeavoured to collect portraits of the pilots, and brief particulars of their careers, in order that our readers may take a more intimate interest in the race. Some of the pilots are shy folk, however, more particularly those who are officers serving in the R.A.F., of whom several are competing in the King's Cup Race, and consequently our gallery of portraits, and personal notes, are not as complete as we could have wished. That, however, cannot be helped, and must be blamed on circumstances over which we had no control.

On this and subsequent pages we give photographs of all the aircraft types taking part, and personal notes and portraits of some of the pilots who will handle the various types in the race. The number in brackets behind the name of a pilot represents the racing number of the machine which he is flying in the race.



ARROW "ACTIVE"

Hermes II B.

Racing Number : 42

WINCOTT (42)

Flight-Lieutenant C. B. Wincott started his aviation career by working in the shops of the Sopwith Aviation and the Martin & Handasyde Companies, from the time he left school until he learnt to fly on a Maurice Farman at Chingford in May, 1916, as a probationary Flight-Lieutenant, R.N.A.S. From June, 1916, until February, 1917, he was at Manston flying Bristol Scouts and Sopwith Triplanes. In March, 1917, he went overseas with No. 2 Wing of the R.N.A.S. to the Eastern Mediterranean, and remained there until August, 1918, flying Sopwith 1½ Strutters on day and night bombing raids, and Henri Farmans on bombing raids at night and submarine patrols by day. For the last eight months of this time he was with a Camel Squadron on fighting patrol work.

On returning home he was posted to



Flt.-Lt. C. B. Wincott (42)

Burgh Castle in Norfolk, where he did escort duty on Camels over the North Sea. He finished war service by being demobilised from Manston in July, 1919. After that he set out to East Africa for three years to make his fortune growing coffee, but as the fortune did not materialise he came home and rejoined the R.A.F. as a short service officer, being posted to Leuchars in February, 1923. From then until April, 1929, he served with the Fleet Air Arm, during which time he was in H.M.S. *Argus* and H.M.S. *Eagle* flying Nightjars and Flycatchers. In 1928 he received his permanent commission, was promoted to Flight-Lieutenant, and joined Martlesham Heath in May, 1929. In August of the same year he was given command of "A" Flight No. 22 Squadron, an appointment which he still holds, being employed in the performance testing of single seater aircraft.

AVRO "AVIAN"



Engines fitted are : Cirrus III, Hermes II, Genet Major and Gipsy I.

Racing Numbers

12, 22, 23, 32 and 36.

MISS BROWN (32)

Miss Winifred Brown, who is flying her own Avian (Hermes II) is of course well-known by virtue of the fact that she won last year's race in a similar but somewhat older machine. Her flying experience dates back to 1926, when she first became a member of the Lancashire Aero Club. In March of the following year she obtained her "A" licence, at the same time gaining the distinction of being the first lady flying member of that club to do so. Later that year she went out to Australia, and through the courtesy of the flying club at Sydney, who lent her a machine, she was able to do quite a lot of flying. At the end of the same year she returned home and purchased her first machine, the well-known EBVZ. During the following year she became a prominent figure by attending most of the flying meetings, and won the big race at Blackpool on the occasion of their summer pageant.

JOHNSTONE (22)

Mr. A. C. P. Johnstone was until last March an employee of the Cirrus Aero Engines Ltd., and is the holder of ground engineer's licences for these engines. He was taught to fly by the late Col. G. L. P. Henderson, and

obtained his "A" licence in 1929. The event on July 25 will be the first air race in which he has competed.

JOHN (23)

Lieutenant Caspar John, R.N., first entered the Navy in September, 1916, and on his promotion to Lieutenant in August, 1925, he learnt to fly. During the years 1927-28-29 he was serving in China, and did not therefore have much opportunity for exercising his powers as a pilot. In April, 1930, however, he bought his own machine, an Avian, and has since used it as his sole means of transport when travelling in England, Ireland, or on the Continent. Like many other Naval officers, he naturally wishes to make the most of what leave he gets, and an aircraft helps him to do so by making the time occupied in travelling very short indeed. He has not so far had very much racing experience, but flew in last year's King's Cup race, performing very creditably.

FRANKLYN (12)

Arthur Franklyn is another dirt track rider, who has learnt to fly comparatively recently, and will be flying his own Avro Avian (Gipsy I) in the race.



Miss Winifred S. Brown (32)



Mr. A. C. P. Johnstone (22)



Lt. Caspar John, R.N. (23)



Mr. Arthur Franklyn (12)

BLACKBURN "BLUEBIRD"

Engines fitted Gipsy I and Hermes I

EDWARDS (31)

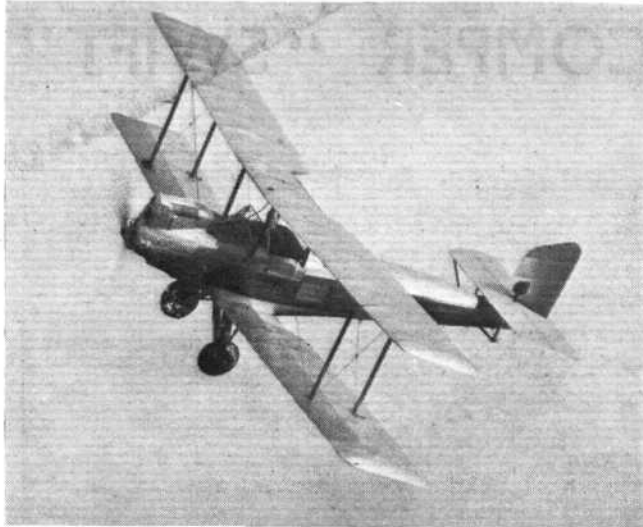
Flying-Officer E. C. T. Edwards joined the Oxford University Air Squadron in October, 1925, and learnt to fly with them. After leaving Oxford in July, 1927, he was lucky enough to be granted a permanent commission

Racing Numbers : 2, 5, 10, 30 and 31.

in the R.A.F. in April, 1928, and was posted to No. 3 Flying Training School at Grantham. His promotion to Flying-Officer followed in October, 1928, while in April of the following year he was transferred to No. 32 (Fighter) Squadron at Kenley. He was then sent



Sqdn. Ldr. J. W. Woodhouse, D.S.O., M.C. (5)



Flt.-Lt. J. Bradbury (2)

to No. 600 (City of London) (Bomber) Squadron, Hendon, and in February, 1930, became Assistant Adjutant, an appointment which he still holds. Mr. Edwards has taken part in several races, the most recent of which was the London-Newcastle race, when he was the first away in a Klemm machine. In the King's Cup he is flying Sir Robert McAlpine's Bluebird (Hermes I).

WOODHOUSE (5)

Squadron-Leader J. W. Woodhouse is one of the older pilots in the race, having been born at Southport in July, 1888. After receiving his early education at Taunton School and Birmingham University he served an engineering apprenticeship in the works of Alldays & Onion Ltd., of Birmingham, and later became a partner in Ernest Smith & Woodhouse, Ltd., manufacturers of "Regal" motor-cycles. Before the war he was a well-known figure on the track, and raced extensively both on cars and on motor-cycles here and on the Continent. His

flying career dates back to 1913, and he actually took his licence at Shoreham in 1914. Going to France in the same year he was a member of No. 4 Squadron, and has the distinction of being the first pilot to land a spy successfully behind the German lines. Later he was with No. 50 Home Defence Squadron, and had the unpleasant experience of being lost over the North Sea for several hours after having attacked and driven off a Zeppelin. At present Squadron-Leader Woodhouse is in command of No. 207 (Bombing) Squadron at Bircham Newton.

BRADBURY (2)

Flight-Lieutenant J. Bradbury transferred from the Army to the R.F.C. in 1917, after which he flew extensively in France. From 1919 to 1920 he was with the R.A.F. in Egypt, and from 1921-25 in India, seeing active service in Waziristan in 1923 and 1925. Since 1926 he has been employed as a test pilot at Martlesham.

CIVILIAN "COUPÉ"

Genet Major.

Racing Number : 16.



F/O. V. S. Bowling (16)

BOWLING (16)

Flying-Officer V. S. Bowling joined the Royal Air Force in December, 1927, with a short service commission, and was posted to Digby for a flying training course. After this, in December, 1928, he went to No. 503 Squadron at Waddington for a year, and in November, 1929, was posted to No. 501 Squadron at Filton. In February of the following year he went to the Central

Flying School at Wittering for an instructor's course, and in May returned to No. 2 Flying Training School at Digby as an Instructor. At the end of the year he went through the blind flying course at Wittering. So far his civilian activities and flying have been comparatively small, although he is a member of the Bristol and Wessex Aeroplane Club. In the race he is flying a Civilian Coupé (Genet Major).

COMPER "SWIFT"

Pobjoy R.I.

Racing Number : 34.



Sqdn. Ldr. J. M. Robb,
D.S.O., D.F.C. (34)

ROBB (34)

Squadron-Leader J. M. Robb has, although he was flying for the greater part of the war, had no incidents in his life of outstanding interest, or at least so he says. As he went overseas in 1916, however, and remained there until 1919, we can but assume that like so many serving officers his modesty will not allow him to divulge many of the details which we feel sure must have been interesting during his career. From 1920-22 he was with

No. 24 Squadron, and from 1922-25 he served overseas in Iraq and Kurdistan. In 1926 he did a year with No. 3 Squadron at Upavon, and became the Chief Instructor at the Central Flying School, Wittering, from 1927-1930. He is now with the Superintendent of Reserve. In the race this year he is flying a little single-seater Comper Swift, fitted with the exceptionally interesting Pobjoy engine, the only British geared light aircraft engine.

CURTISS-REID "RAMBLER III"

Gipsy III.

Racing Number : 35.



Mr. J. C. Webster (35)

WEBSTER (35)

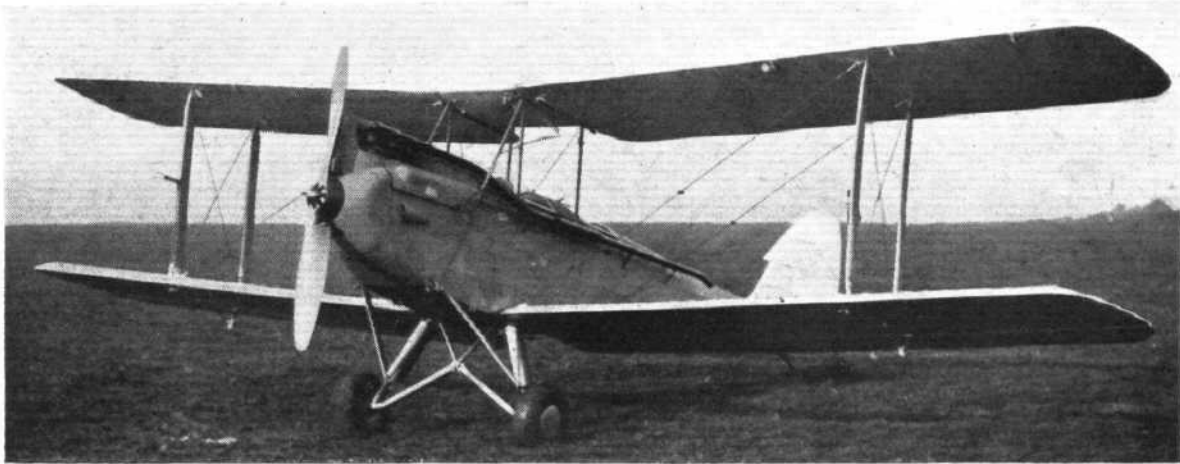
Mr. J. C. Webster is the only representative from our Dominions flying in this year's race. Also it is the first occasion on which anyone has brought a machine from the Dominions specially for the race. Mr. Webster learnt to fly at the Montreal Light Aeroplane Club in the summer of 1928, gaining his instruction from Captains Sparks and Spooner, both of whom were well-known in light aeroplane club circles in this country before going to Canada. Since actually taking his "ticket" he has completed nearly 300 hr. flying as a pilot, and although he has flown extensively in Canada he has never had any particularly exciting experiences. Naturally, a very great deal of his flying in Canada has been on the snow, and he finds flying over England a very different proposition, since, as he recently put it, "there you may sometimes

fly over hundreds of miles without noticing any very great change in the landscape, while here in England everything seems to be all of a heap." His flight in the King's Cup this year will be the longest day's flying he has yet done, but if one may judge from the record of his work as a Director of the Montreal Flying Club and from Mr. Webster himself, no one is likely to try harder and is, by dint of sheer perseverance, more likely to secure a leading place at the finish. We have already described how Mr. Webster brought his machine over to England without any special packing, but simply with the wings folded, and how it was unloaded at Hamble and flown away within a very short time, and in connection with his arrival Mr. Webster would like to express his sincere appreciation and gratitude for the kindness and assistance showered upon him by everybody in England.

DE HAVILLAND "GIPSY MOTH"

Engines fitted :
Gipsy I and Gipsy II.

Racing Numbers : 6, 7, 8, 9, 11, 15, 17,
20, 24, 25, 26 and 33



SHIPSIDE (8)

Mr. T. W. Shipline is a civilian who first started flying in 1928, and has owned his present Moth (Gipsy) since August, 1930. He is one of the growing number of men who use their aircraft in the ordinary way of business, and together with his wife has flown all over the country. It is interesting to note that Mr. Shipline is the Morris Car Distributor for Nottinghamshire and part of Leicestershire, and that he has found his aircraft invaluable for increasing his business, as it allows him to cover far more ground in the same time than he could otherwise do.

GUEST (25)

Squadron-Leader Rt. Hon. F. E. Guest has command of No. 600 (City of London) (Bomber) Squadron, which is one of the squadrons of the Auxiliary Air Force stationed at Hendon. He is also Deputy Master of the Guild of Air Pilots and Air Navigators, and is well known for the part he played in laying the foundations for National Flying Services, Ltd. He took his pilot's licence in September, 1929, at Heston Air Park with Airwork, Ltd., and has since owned a series of machines and carried out extensive trips to Africa and other places. From 1921-22 he was Secretary of State for Air, and has been indefatigable in furthering aviation in many and varied ways.

WILSON (20)

Mr. G. N. Wilson is a civilian pilot with some 75 hours' flying experience, who learnt to fly at Heston Air Park just a year ago. Like the majority of private owners and civilian pilots, his flying career has been almost entirely devoid of lurid or exciting events, and, although he uses his machine for business in all weathers, he has never yet found cause to agree with the daily Press which would have its readers believe that flying is dangerous.

SYMONDSON (9)

Mr. F. S. Symondson started flying in June, 1914, when he made a flight with the late Frank Goodden in a Blériot. During the war he transferred from the Glamorgan Yeomanry to the R.F.C. in 1917 in Egypt, where he learnt to fly on "Rumpities." From there he was posted to France, and flew with No. 29 Squadron on Nieuports. In November he returned home on leave, and, after flying Camels for a while, went to Italy with them in No. 66 Squadron, where he remained until the end of the war. He was shot down once in Belgium and twice in Italy, and in all he is credited with having brought down twelve enemy aircraft. He now operates his own Moth from a flying field which he has established in Devonshire.

GOUGH (24)

Mr. Fred Gough joined the Royal Flying Corps as a private in 1916 at the tender age of 16 years 9 months, ultimately becoming a cadet, but was not gazetted until just after the formation of the R.A.F., when he was sent to Duxford, and was one of the first pupils to be trained at that aerodrome. He was then posted to No. 49 Squadron, but only reached France a few weeks before the Armistice was signed. Four years ago, when the Norfolk and Norwich Aero Club was formed, he started again on his own and flew a D.H. 53 with a Tom Tit engine. For a year after that he had one of the early Avians (Cirrus III), and is now the owner of a Moth (Gipsy I). Besides the 200 hours' flying which he put in during the war, he has done well over 500 hours since the Norwich Club was formed.

FAWCETT (17)

Mr. T. C. Fawcett, who is flying his own Moth (Gipsy I), had his first lesson in July, 1930. After securing his "A" licence in October, he bought his present machine, and has since flown some 120 hours in this country.



Mr. T. W. Shipline (8)

Capt. the Rt. Hon. F. E.
Guest, P.C., D.S.O. (25)

Mr. G. N. Wilson (20)

Mr. F. S. Symondson (9)

DE HAVILLAND "PUSS MOTH"

Gipsy III

Racing Numbers : 37, 38, 39, 40 and 41.



LADY BAILEY (39)

Lady Bailey, who is President of the Suffolk Light Aeroplane Club, is extremely well known for the wonderful long-distance flights she has undertaken and completed successfully, and for the interest which she is known to take in every side of the light aeroplane movement. She learnt to fly at the London Aeroplane Club in 1927, and the following year made a solo tour to Cape Town, via Malta and Cairo. The return journey was made via the Belgian Congo, Angola and the French Congo, and was undoubtedly one of the finest performances ever put up by a woman pilot. Lady Bailey has had considerable experience of racing and flew in the King's Cup race for 1927, 1929 and 1930. In the latter two years she also competed in the Round Europe International Touring Competition, and, whenever she is not undertaking some long tour abroad, is always to be seen at one or other of the week-end flying meetings which are held by the light aeroplane clubs in England.

RODD (37)

Lieutenant Geoffrey Rodd, R.N., is a young man who, blessed with an ample share of this world's goods, started flying simply because it was a much quicker and more comfortable way of getting about than in a car. His first machine was an Avian (Hermes), which he used to run in conjunction with a 30/98 Vauxhall. Now, however, as the speed of that combination was not enough for him, he runs a Puss Moth as well as a Speed Six Bentley. He is probably unique, in that he has had his chauffeur, Mr. J. Camp, taught to fly at the Hanworth Club, so that he can have either his aircraft or his car brought to him when he requires them. He does a great deal of Continental flying, and since he believes in doing a job

thoroughly, he has qualified for the practical part of his "B" licence, and hopes shortly to take his second-class navigator's ticket. His enthusiasm can be gauged by the fact that, although he has only been flying a year, he has already done 500 hours.

IRWIN (38)

Mr. A. C. S. Irwin, who was educated at Marlborough and Sandhurst, started his military career in the Royal Irish Rifles, in 1916, in Dublin, but soon transferred to the R.F.C., and obtained his pilot's ticket in September of that year. He proceeded to France in 1917, and, after bringing down two German aircraft, was shot through the foot by a machine of the famous Richthofen circus. After recovering, he was posted to the Home Defence Wing, and remained with No. 112 Squadron in Kent until the end of the war, during which time he took part in defending London during every raid until these ceased on Whit-Monday, 1918. He returned in 1919, and has since been engaged in the estate business.

JACKAMAN (41)

Mr. A. C. M. Jackaman has already owned four machines, although he only started flying in June, 1927. He has flown in the King's Cup Race three times, finishing 7th, 11th, and 30th, so this year he is hopeful that he has reached the bottom of the descending cycle and that he will start again finishing near the beginning. Mr. Jackaman is a man who flies on every possible occasion, and has raced and taken part in competitions both in this country and all over Europe. Up to date he has flown 1,250 hrs., as well as somewhere about 130 hours in the Auxiliary Air Force.



The Hon. Lady Bailey (39)



Lieut. Geoffrey Rodd, R.N.
(37)



Mr. A. C. S. Irwin (38)



Mr. A. C. M. Jackaman
(41)

SOUTHERN "MARTLET"

Genet II.

Racing Numbers : 28 and 29.



F/O. H. H. Leech (29)

LEECH (29)

Flying Officer H. H. Leech is a well-known figure at flying meetings, as his aerobatic demonstrations in the Martlet are always amongst the prettiest to be seen. He originally learnt to fly at Cramlington with the Newcastle-on-Tyne Aero Club, after which he entered Cranwell as a cadet in 1925, finally leaving there and being posted to Tangmere in 1927. In 1930 he went to the Royal Aircraft Establishment at Farnborough, and has since been engaged on a great deal of test work, flying a large variety of machines. This

year he was selected as one of the members to join the High Speed Flight at Felixstowe preparatory to receiving his training to take part in the forthcoming Schneider Trophy Race, but, much to his disappointment, he was later sent back to Farnborough, as it was found that there were too many pilots in the flight. F/O. Leech has raced on numerous occasions in light aircraft, and is always consistent.

BRAMSON (28)

Mr. M. L. Bramson's history shows him to be a man of great initiative, since in 1919 he bought a Nieuport two-seater with an 80-h.p. Le Rhone engine from the French surplus war stock, and bribed a French flight-sergeant to take a few days' leave and teach him to fly. In this machine he flew some 18 months while he was in France, before he sold it on his returning home. In England he took up sky writing and was in charge of the Scandinavian Sky-Writing Expedition in 1923-24. Again his initiative came to the surface, when he misappropriated his firm's property for the purpose of writing a lady's name in the sky. He sincerely hopes that Major Savage will now forgive him for this misdemeanour, as the lady has now become his wife, and he feels that the means justified the end. Since 1925, Mr. Bramson has flown at many of the light aeroplane clubs, and latterly he has interested himself in the success of the Hanworth Club.



Mr. M. L. Bramson (28)

SPARTAN

Engines fitted : Hermes II and Cirrus III.

Racing Numbers : 3, 4, 14 and 19.

CARNEGIE (4)

Squadron-Leader D. V. Carnegie, A.F.C., is one of the most experienced flying-boat pilots in the country, who joined the R.N.A.S. and was at the flying-boat stations at Felixstowe and Killingholme until the Armistice. During 1920-1924 he served, still with flying-boats, in the Mediterranean at Malta, Alexandria and Constantinople, and undertook long-distance flights with Air Commodore Samson. He then came home, and until 1927 was employed on flying-boat test and development work at the Marine Aircraft Experimental Establishment, Felixstowe, during which time he was honorary instructor to the Sussex Aero Club, and also owned a D.H. 53. During this time, namely, in 1926, he took command of one of the Southampton flying-

boats which carried out an extended tour of the Mediterranean. Again, in 1927-1928, he was in the Far East Flight which was successfully carried out by a fleet of Southampton boats. In 1919 he made several flights between Singapore and Calcutta surveying an air route, and for eighteen months was honorary instructor of the Singapore Flying Club, which is one of the few flying clubs in the British Empire using light seaplane aircraft. On return to England in 1930, he became an instructor for instruction in flying-boats at Calshot. He also purchased a Gipsy Moth and took part in the last year's King's Cup, but had the misfortune to crash through engine failure just after taking off. He was promoted to Squadron Leader in June this year after having done 3,000 hours as a flying-boat pilot.



THE SPARTAN: In the race are entered two with Hermes II and two with Cirrus III engines.

WESTLAND "WIDGEON"

*Engines fitted: Gipsy I, Genet II,
Cirrus III and Hermes II.*

*Racing Numbers:
1, 18, 21 and 27.*

ORMSTON (1)

Mr. Jack Ormston is better known as a Speedway rider than as a pilot, having been a most successful rider for Wembley during the past three seasons, and he is still only 21 years of age. He first started flying last year, when he owned an aeroplane in partnership with Roger Frogley, another well-known Speedway rider. Early this summer Mr. Ormston took up flying seriously at the Herts and Essex Aero Club at Broxbourne, which was founded by a

Speedway team-mate of his, Arthur Frogley, a brother of the afore-mentioned Roger Frogley. He obtained his "A" certificate on June 5 last, and altogether he has done some 50 hr. solo flying. Soon after he obtained his certificate, Mr. Ormston bought a Westland Widgeon (Cirrus III), and it is this machine which he will fly in the King's Cup race. Mr. Ormston has already used his aeroplane on several occasions as a means of travelling between one speedway track and another, or from Wembley to his home at Coxhoe, Co. Durham.



Mr. J. G. Ormston (1)

AIRCRAFT TYPES IN THE KING'S CUP RACE

The following types and numbers of aircraft have been entered:—

	Machines.
Arrow "Active" (Hermes II)	1
Avro "Avian" (Cirrus III)	2
Avro "Avian" (Genet Major)	1
Avro "Avian" (Gipsy I)	1
Avro Sports Avian (Hermes II)	1
Blackburn "Bluebird IV" (Gipsy I)	3
Blackburn "Bluebird IV" (Hermes I)	2
Civilian Coupé (Genet Major)	1
Comper "Swift" (Pobjoy R.1)	1
Curtiss-Reid Rambler III (Gipsy III)	1
De Havilland "Moth" (Gipsy I)	10
De Havilland "Moth" (Gipsy II)	2
De Havilland "Puss Moth" (Gipsy III)	5
Southern "Martlet" (Genet II)	2
Spartan (Hermes II)	2
Spartan (Cirrus III)	2

Westland "Widgeon" (Gipsy I)	1
Westland "Widgeon" (Genet II)	1
Westland "Widgeon" (Hermes II)	1
Westland "Widgeon" (Cirrus III)	1

Total 41

ENGINES IN THE RACE

The following engine types and numbers are fitted in the machines entered:—

De Havilland Gipsy I	15
De Havilland Gipsy II	2
De Havilland Gipsy III	6
Cirrus III	5
Hermes II	5
Hermes I	2
Armstrong Siddeley Genet II	3
Armstrong Siddeley Genet Major	2
Pobjoy R.1	1

Airport News

ANOTHER MUNICIPAL VENTURE



PLYMOUTH'S AIRPORT: H.R.H. The Prince of Wales, accompanied by the Mayor, Deputy Mayor and the Town Clerk, arriving at Roborough Aerodrome, which the Prince "declared open."

ALTHOUGH the aerodrome at Roborough has been in use for some time, it has not hitherto received an official opening by any important personage, and this omission was rectified by no less a person than H.R.H. the Prince of Wales on Wednesday, July 15.

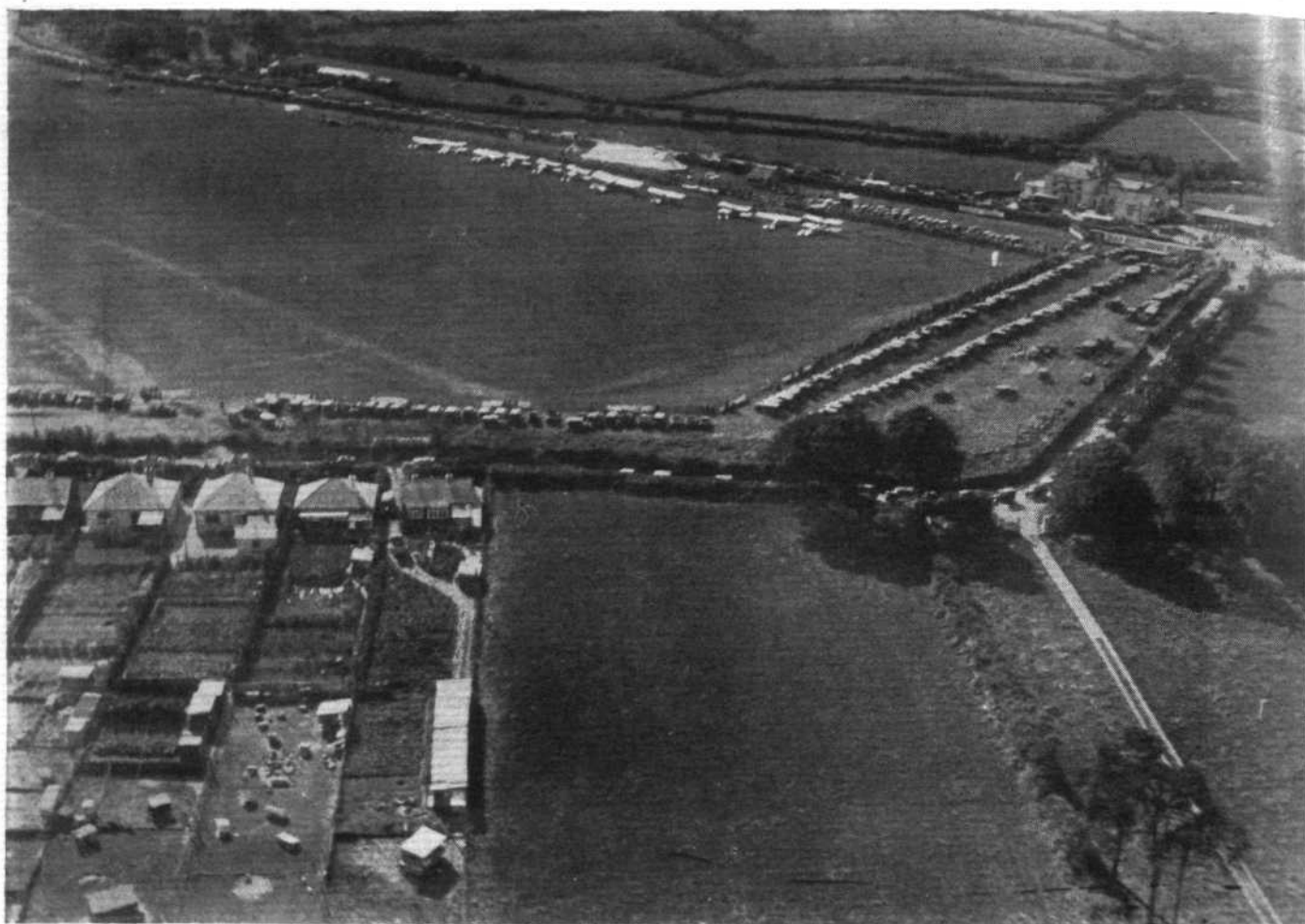
Very naturally a large programme had been arranged, which included an opening ceremony about noon, to be followed by a display; but, owing to the vagaries of the West Country weather, a change of plans was made necessary. The event had been timed to coincide with a visit which the Prince of Wales was to make to the Scilly Islands by seaplane, but when the authorities conferred together on Tuesday evening the local weather forecast gave no promise of suitable conditions, and this visit was therefore regretfully postponed. The Prince of Wales did, however, visit Plymouth, and went down there by train on Tuesday night instead of his more usual method by air. During the morning and the afternoon up to about 4 o'clock he was very fully occupied opening such places as the new headquarters of the British Legion and making many other visits. Although the flying programme had suffered a serious set-back by the altered arrangements, quite a reasonable display was proceeded with during the afternoon. This took the form of a series of demonstrations, and included such machines as the Redwing (Genet II), the Vickers Vialra (three Jupiters), the Westland Wessex (three 7-cylinder Genet Majors), the Saro Windhover (three Gipsy II), the Avro Avian (Hermes II), the Moth (Gipsy II) and the Westland Widgeon (Hermes II). After the majority of the flying display had been given, that is, at 4 o'clock, the Prince of Wales arrived, and at the request of the Mayor, formally declared Plymouth Airport open. In making this declaration, he again expressed his great regret that he had been unable to fly there, and, as he originally in-

tended, to continue his flight to the Scilly Islands; but he said that the reception of a souvenir of his visit, in the shape of a silver model of his own Puss Moth, compensated him to a large degree. After this he entered the Westland Wessex (three 7-cylinder Genet Majors) which Flt.-Lieut. E. H. Fielden had brought down from Yeovil during the morning, and, together with Admiral Sir Lionel Halsey, returned to London, visiting Yeovil on the way. During the afternoon the Coastal Defence Communication Flight—which was in camp on the aerodrome—gave a display of formation flying with three Fairey III.F's. Other items were a display of aerobatics by Mr. F. Symondson, on his Moth; a comic turn by a pseudo-beginner on the Avian, whose identity was not disclosed; bombing a submarine, also by an unknown pilot, who scored at least one direct hit; and finally a demonstration flight for a large number of the Councillors in the new Handley-Page "Hannibal."

This last machine was, of course, the centre of interest, and is undoubtedly an ideal machine for an occasion such as this, when it is vitally necessary for the success of the whole undertaking that such people as councillors should realise that travelling by air can be comfortable. We ourselves



The Westland "Wessex" in which the Prince of Wales flew back to London from Plymouth, piloted by Flt.-Lt. E. H. Fielden.



PLYMOUTH'S AIRPORT: An aerial view of Roborough aerodrome taken on the occasion of the official opening by the Prince of Wales.

were fortunate enough to be able to make the journey from Croydon to Roborough and back again in her. For those who are used to travelling by air in most of the modern cabin machines, she is certainly a revelation of quietude and comfort, and it is no exaggeration to say that the noise is considerably less than in any underground train and many of the ordinary trains. Conversation could be carried on across the breadth of the cabin with ease, and her bulk makes her a very steady platform for the two stewards who minister to the comfort of her occupants. The upholstery is unpractical and the cellon windows will certainly soon colour in the tropical sun, but otherwise the internal fittings are reasonably suitable. From the pilot's point of view we understand that she is quite satisfactory and very easy to fly. Imperial Airways are, therefore, to be congratulated on the very great advance they have made towards increasing the comfort of their passengers. It seems unfortunate, perhaps, that the same increase of comfort could not have been achieved with a similar increase in speed, since speed is the only justification which a company like Imperial Airways has for offering aircraft as a method of travel to the public; but naturally, human nature being what it is, they will not be able to sell this speed without comfort and good service. Imperial Airways is virtually a monopoly company, and, as such, they have a duty to perform, not only to all their shareholders, but also to the general public, who are their potential customers, and it is for this reason we are so glad to see that Hannibal provides a degree of comfort which has very definitely been lacking in the other regular air liners. This shows that Imperial Airways are realising their obligations in these matters, and we can feel assured that they are not going to become what would be fatal to them, namely, "railway-minded," and therefore, from the service they provide, both in their staff and their stock, figuratively speaking, tell their customers to take it or leave it.

After Hannibal had disgorged her large number of delighted Councillors, Capt. Stewart took the air to make another of his parachute drops. On this occasion he was,

however, not so fortunate as on previous occasions, and the wind carried him beyond the aerodrome and laid him gently in a rose bed of a neighbouring house. We naturally dashed over quickly to render any assistance which might be necessary, but found him surrounded by young ladies from the house, who appeared quite capable of administering to his wants, so we left him to it and heaved a sigh of relief that his landing was not on the roof of the house. Capt. Stewart recently acted as instructor for a parachute drop which was made by Miss Delphine Reynolds. This jump was made, not for a stunt or in any way as a demonstration, but merely in order that Miss Reynolds should be familiar with the technique of parachute jumping should she at a later date have cause to save her life by so doing. We understand the Air Ministry are now prepared to permit people to make jumps under such conditions, and it seems quite a reasonable attitude to take, for those who propose wearing parachutes when flying should, surely, be instructed as to how to use them. Great care was taken with Miss Reynolds, and after a considerable amount of ground instruction, which included getting out and off the machine while it was on the ground, chocked up into flying position with the engine running, she was taken up when the wind was negligible and told where to jump. This she did, and made a perfectly satisfactory drop, landing in the middle of the aerodrome. Capt. Stewart uses a Russell Lobe parachute, and for all such jumps as that of Miss Reynolds, he proposes to continue doing so, for it has the very great merit that, when once opened, its wearer does not swing about at all.

The aerodrome at Roborough is being run entirely by the municipality, and has in Mr. F. J. Dean, its own airport officer, who is a senior municipal officer, and answerable to none except his airport committee. Mr. Dean has the advantage that he knows municipal procedure, as, before taking on this job, he was one of the City's assistant surveyors. This seems to us a very admirable arrangement which should be followed by other municipalities, for the average city or town councillor does not know very much about flying and is often starting an aerodrome somewhat

against his wishes. Therefore for them to obtain a thoroughly qualified man to take charge on their behalf seems the most sensible way. Many municipalities have, of course, let the management of their aerodromes to a flying club or aviation company, and there is, equally, a very great deal to be said for this method, in fact, probably

that whereas the former would be better for some places, the latter would be better for others, while the method which has been adopted, in at least one case, of an airport committee themselves actually running the aerodrome and their manager, not being given full charge and a free hand, cannot, as far as we can see, lead to any satisfactory result.

CROYDON

WE have had a week of vile weather, low clouds and rain have persisted, and the aerodrome has had the aspect of mid-November instead of July; but all the services have been fully maintained. Every company has been exceptionally busy, and they have all been placing every available machine on service. This has been due to a gold rush, and there has been five and six special machines daily full to capacity with gold, which has been sent to Germany, Belgium, Holland and France. One imagines that the Bank of England coffers must be nearly empty. On Thursday alone 17 tons of gold left Croydon. With the usual services and all these specials, 70 odd machines arrived and departed from here on this day. The Air Union are also doing good business on their passenger services, and it is very seldom they run less than two machines on each service. Imperial Airways have now placed Hadrian on service, and, with his brother, Hannibal, they are maintaining services of clockwork regularity, coupled with high speed. These two machines are really wonders, and the more one sees of them the more impressed one becomes. The third machine of this type is expected early next week.

On Monday we had another American visitor. Everyone was positive that this machine was a "Lockheed Vega"

until inspected at close quarters, and it was found to be a "Fleetster." It looks a beautifully-finished craft, and, like most American aircraft, it can certainly move. It is the property of Mr. G. Harding, of Chicago, and the chief pilot is Capt. Brock, who, it will be remembered, flew the Atlantic some years back with his companion, Schlee.

Miss Amy Johnson brought her Puss Moth over to be fitted with lights by British Air Transport, and she left again later in the week.

Hannibal visited Plymouth on Wednesday for the opening of the new Air Port there.

A new Fordson caterpillar tractor was tried out by Imperial Airways on Friday for the hauling of their larger aircraft. They have at present a Citroen Kegness tractor, which has done valuable service, but is hardly strong enough for the new machines.

Mr. Brie paid us a visit on Saturday on one of the latest Autogiros.

Cirrus Hermes people are very busy just now overhauling a number of private machines in readiness for the "King's Cup" Race on Saturday.

The traffic figures for the week were:—Passengers, 1,520; freight, 88 tons.

P. B.

Municipal Aerodromes.

The following is a report issued by the Air Ministry on the progress of Municipal Aerodromes up to June 30 last.

Towns which have licensed aerodromes (8)—

Blackpool	Ipswich	Nottingham
Bristol	Liverpool	Plymouth
Hull	Manchester	

Towns which have purchased sites (9)—

Brighton	Portsmouth	Stoke-on-Trent
Carlisle	Sheffield	Walsall
Leicester	Southampton	Worthing

Towns which have reserved sites in their Town Planning Scheme (15)—

Abergavenny	Lytham, St. Annes	Skegness
Basingstoke	Maidstone	Southwold
Blyth	Milton U.D.C.	Weston-super-Mare
Chorley	Poole	Winchester
Littlehampton	Rotherham	York

Towns which have had sites inspected (84)—

Aberystwyth	Bridlington	Glasgow
Aberdeen	Burnley	Gloucester
Aldershot	Burton	Grantham
Aylesbury	Cambridge	Great Yarmouth
Barnet	Cardiff	Greenock
Barnsley	Cheltenham	Grimsby
Bath	Chester	Guildford
Bedford	Crewe	Halifax
Belfast	Derby	Harrogate
Bexhill	Doncaster	Harwich
Birmingham	Eastbourne	Hastings
Bognor	Edinburgh	Hereford
Bournemouth	Falkirk	Huddersfield
Bradford	Gateshead	Huntingdon

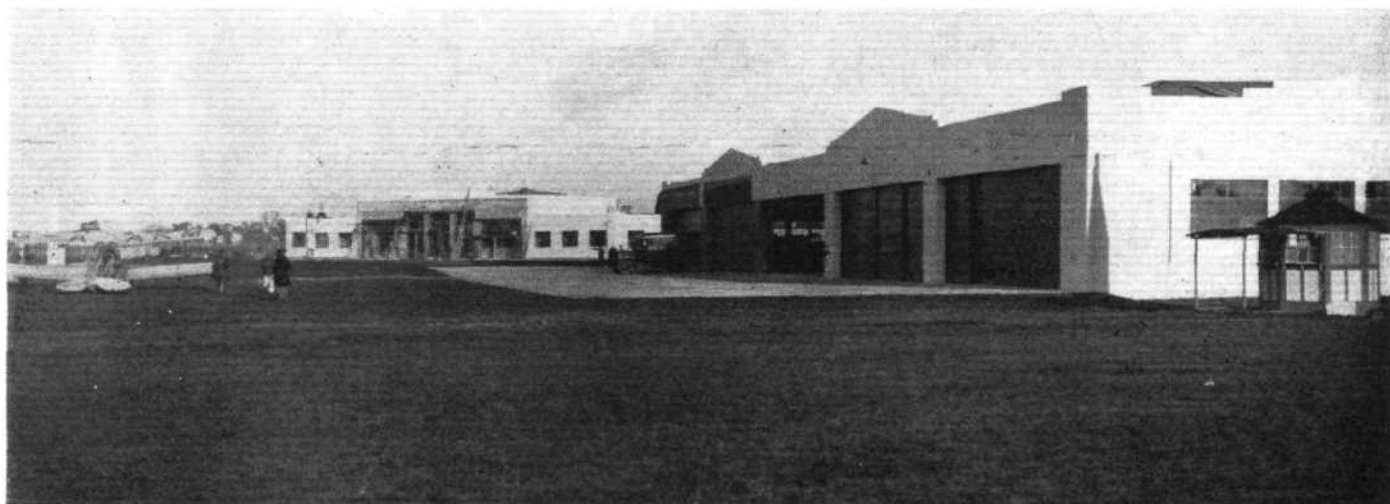
Huyton	Northampton
Inverness	Northam, Devon
Irvine	Norwich
Kidderminster	Peterborough
Leek	Rochester
Leeds	St. Albans
Lincoln	Scarborough
Middlesbrough	Slough
Middleton	Southend
Morecambe	Southport
Motherwell	South Shields
Newport (Mon.)	Stirling
Newton Abbot	Stratford
Newcastle	Swansea

Towns which are awaiting inspection of sites (3)—

Colchester	Gravesend	Witney
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Towns which have displayed interest in aerodromes other than above (51)—

Airdrie	Gillingham	Pwllheli
Barrow	Hamilton	Redruth
Bolton	Haverfordwest	Renfrew
Buckie	Haywards Heath	Rochdale
Burry Port	Hebburn	Rugby
Caerphilly	Jarrow	Salisbury
Cannock	Kingston	Shrewsbury
Chesterfield	Lancaster	Sunderland
Coventry	Llandrindod Wells	Thornton, Lancs.
Darlington	Loughborough	Truro
Dover	Luton	Wadebridge U.D.C.
Douglas, I. of M.	Merthyr	Walton-on-Naze
Dundee	Neath	Wallasey
Dunfermline	North Berwick	Wigton U.D.C.
Durham	Nuneaton	Wrexham
Exeter	Perth	Winsford
Folkestone	Pontypridd	Yecivil



THE HANGARS AT HATFIELD: A corner of the de Havilland Aerodrome at Hatfield, Herts.

Private Flying & Club News

THE CLEETHORPES MEETING.—Exceptionally bad weather made the meeting at Cleethorpes on Saturday, July 18, a very difficult matter to carry through successfully, but, in spite of serious setbacks, the management, in conjunction with the Lincolnshire Aero Club, put up quite a good show. The original programme had to be abandoned, as so many of the people actually named in it did not turn up. The impromptu programme, which was arranged on the spot, apparently satisfied the spectators, who, it was estimated, numbered between 30,000 and 40,000. The first event was a demonstration of the Redwing, which, it will be remembered, is already well known in the North country, as the Scarborough Club have acquired at least one for instructional purposes. A balloon bursting competition, which followed, was won by Mr. R. T. W. Clayton on a Bluebird. Capt. Blake then put up one of his usual shows on the Lincock, and showed the crowd what aerobatics really can be when carried out in a small high-power machine such as the Lincock, by a pilot of Capt. Blake's ability. In the aircraft race, Flt.-Lt. Payne came in first on his Redwing (Genet II), with Mr. R. T. W. Clayton second in a Bluebird, and Mr. L. S. Tindell, in a Spartan, tying for the third place with Mr. M. O. L. Scott in a Puss Moth. Capt. Stewart made one of his usual well-judged parachute drops, this time adding a comic touch to his drop by dressing up as Miss Bam Boozle, the famous American lady parachutist. In spite of the high wind, Capt. Stewart landed well into the aerodrome, where everyone could see him. A small competition was organised, called bombing the baby, which consisted of flour bags on a motor-car, and this was won by Flt.-Lt. Russell in a Redwing.

THE RAMSGATE AIR RALLY.—The Air Rally which had been arranged by the Ramsgate Chamber of Commerce to take place during their Sports Week, on Saturday, July 18, was seriously hindered by the weather, as was flying all over the country. Despite this, however, quite a large number of people turned up at Manston Aerodrome to watch the proceedings, and, although the organisation appears to have broken down somewhat, the majority certainly seemed to enjoy themselves. Lord Halsbury opened the meeting, and was supported by the Mayor of Ramsgate, Alderman Terry, together with members of the Ramsgate Corporation. The principal event was the Isle of Thanet race for privately-owned aircraft, and there were six entries. The circuit was two laps of the Isle of Thanet, with turning points at Reculvers Towers, the North Foreland lighthouse, and Ramsgate Harbour lighthouse. The race was won by Capt. Pennington in a Puss Moth (Cirrus III) at a speed of 128 m.p.h., with Mr. L. M. J. Balfour second in a Moth (Gipsy II), and Mr. Percival third in a Hendy 302 (Hermes II). Mr. Balfour's speed being 118 m.p.h., while Mr. Percival made 135 m.p.h. The Isle of Thanet Cup, presented by Mr. C. S. J. Taylor, is a large silver trophy, some 2 ft. 3 in. in height, and is to be competed for yearly, a replica being presented to the winner. There were several other impromptu events, including a demonstration of the slow flying properties of the Spartan Arrow by Col. Strange and an aerobatic display in a Moth (Gipsy II) by Mr. C. Clarkson, the Manager of Selfridge's Aviation Department. After the meeting, Lord Halsbury presented the prizes. Among other demonstrations there was one by the Autogiro, and also some auto-towed gliding with the Lyons Tea Company's Falke sailplane.

HANWORTH CLUB.—On the King's Cup day, Saturday, July 25, members requiring meals at the Club are advised to book their tables by Friday, July 24, particularly for dinner, which will only be served between 8 and 9.30 p.m., as this will be followed by a dance from

10 p.m. until 2 a.m. In order to facilitate arrangements for this latter, members wishing to be present are asked to notify the manageress not later than noon on Friday. Evening dress is optional. On the Sunday following, there will be lawn tennis exhibition matches by Messrs. J. C. Gregory, J. D. P. Wheatley, and Mr. Aoki. These will be preceded at 3.30 p.m. by a fencing exhibition arranged by Professor R. Blomfield Jackson. The bathing pool, which is now open, will not normally be in use on Mondays.

A DEVONSHIRE MEETING.—The annual Air "Rallye," which is always held by Mr. Parkhouse on the aerodrome at Haldon, near Teignmouth, will be on September 5, and will, as usual, be followed by a dinner and dance. These meetings of Mr. Parkhouse's are always among the most enjoyable of the year, for everyone who can afford the time to make the week-end at Teignmouth does so. Mr. Parkhouse is well known for his hospitality and for the genial welcome which he invariably gives his visitors, therefore everyone who can beg, borrow or steal an aircraft would be well advised to steer about 257 deg. true from London on that day.

CINQUE PORTS FLYING CLUB.—Bad weather reduced flying time for the week ending July 19 to 17 hr. 55 min. Several new members commenced instruction, but were unable to do as much as they would have liked owing to bad conditions.

Two of the Club's lady private owners, Miss Aitken and Miss Giles, left for Paris on Thursday in their two Gipsy Moths. It was originally their intention to tour Germany, but the political and financial situation there made this inadvisable.

On Friday, Mr. Waller executed a cross-country flight to Liverpool, landing at Castle Bromwich, Birmingham, on the return flight. This is the first time one of the Club aircraft has visited the new Municipal Aerodrome at Hooton Park, Liverpool. On Saturday numerous visitors arrived by air after the Ramsgate rally, among them Captain Duncan Davis, of Brooklands, and Captain Tommy Rose, late of the Midland Club.

The balloon-bursting competition on Sunday attracted a considerable crowd of both spectators and entrants, the field numbering eight. The event was eventually won by Mr. Waller, who burst two of three balloons in the remarkably short time of one minute. Among the interested spectators of the afternoon's proceedings were the Duke and Duchess of Rutland and the Duke of Anglesea, who, it is understood, are new neighbours at Lympe.



TOURING IN A "VEGA": Miss Margery Durant has been carrying out a sight-seeing tour round the Mediterranean in her Lockheed "Vega." Our illustration shows the machine collecting "Shells" at Tunis, where a halt was made last May.

The AIRCRAFT ENGINEER

FLIGHT
ENGINEERING
SECTION

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July 24, 1931

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AIR-COOLED ENGINE POWER AND WEIGHT.

By W. R. ANDREWS, A.F.R.Ae.S.

Mr. Andrews, who is on the Technical Staff of A. V. Roe & Co., Ltd., has previously contributed articles to THE AIRCRAFT ENGINEER. In the present article he turns his attention to the question of thrust horse-power available at the airscrew for every pound of engine and fuel. Empirical formulæ have been evolved, which appear to give at least sufficient accuracy for preliminary investigations, Mr. Andrews basing his formulæ on the assumption that power output is proportional to cylinder capacity.

THE question of the thrust horse-power available at the airscrew for every pound of engine and fuel is one

which is of great concern to aircraft and engine designers.

With a view to investigating a purely hypothetical case of an aircraft using an engine of fixed b.h.p. and having a given range, the writer obtained empirical formulæ for engine power and weight.

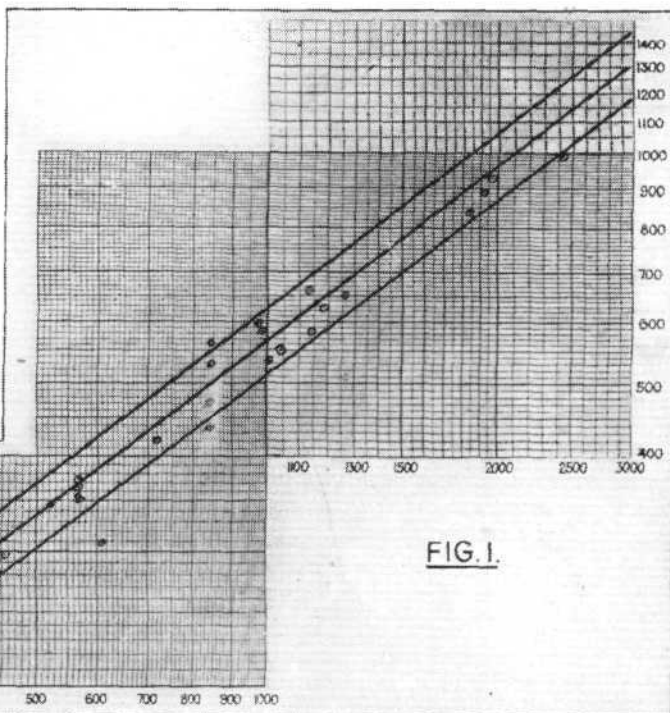
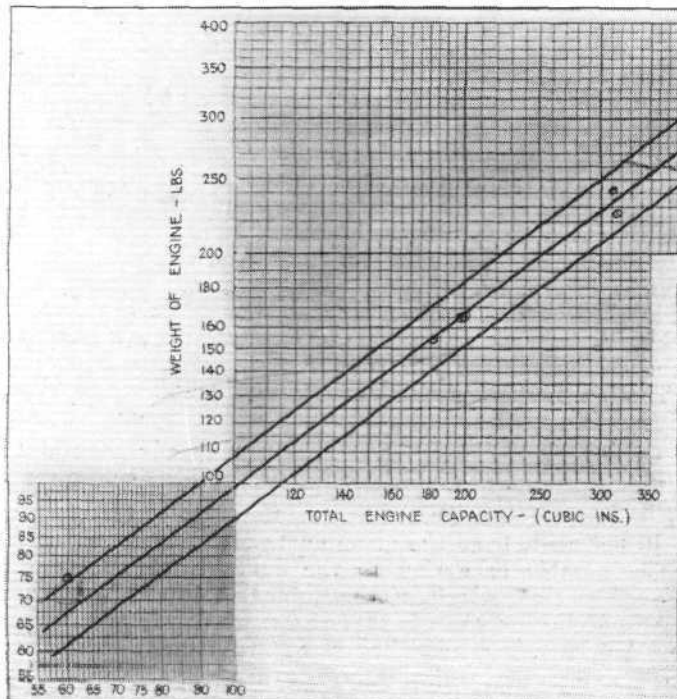


FIG. 1.

These formulæ are sufficiently accurate over a large range of powers to be of use to others interested in similar problems.

As pointed out, these relationships are only empirical, and their only justification is that they agree with the actual conditions within limits which are not too large.

The varying factors in engine design, such as crankshaft r.p.m., number of cylinders, capacity of cylinders, materials used, etc., would at first sight make the task of generalising almost hopeless.

However, it is obvious that since cylinder capacity is somewhat limited by various considerations, as is also the compression ratio, then the power output is proportional to total cylinder capacity at the same design r.p.m.

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TABLE I

Engine.		No. of Cylinders.	Bore. In.	Stroke. In.	Capacity, C Cub. in.	Normal R.P.M. = N.	Normal B.H.P. = P.	P C.N. ⁻⁷¹ = K.	Weight. Lb. = W.	W.N. ⁻⁴¹ P. ⁻⁷⁰ = K ₁ .
Maker.	Name.									
Gnome and Rhone	Titan II; 5 BC ..	5	5.75	6.5	842	1,800	255	0.00148	562	472
	" 5 Kc-Kdr ..	5	5.75	6.5	842	2,000	285	0.00154	528	436
	" Kb ..	7	5.75	6.5	1,180	1,950	370	0.00145	627	420
Lorraine ..	100 h.p. ..	5	4.92	5.51	521	1,350	100	0.00115	344	500
	110-h.p. ..	5	4.92	5.51	521	1,650	110	0.00110	348	531
	120-h.p. ..	5	5.12	5.51	566	1,700	120	0.00108	354	514
	Mizar ..	7	5.51	5.9	985	1,800	240	0.00119	583	515
	Algol ..	9	5.51	5.9	1,264	1,800	300	0.00116	652	486
	Antares ..	14	5.51	5.9	1,970	1,900	500	0.00119	930	488
Salmson ..	3 AD ..	3	2.75	3.39	60	2,000	16	0.00120	75	674
	5 AC ..	5	3.94	5.12	312	1,800	60	0.00094	242	620
	7 AC ..	7	3.94	5.12	436	1,800	95	0.00106	285	508
	9 AD ..	9	2.76	3.38	182	2,000	46	0.00115	154	510
	9 AC ..	9	3.96	5.12	567	1,800	120	0.00103	374	560
	9 N-CT ..	9	3.96	5.51	610	1,800	150	0.00120	308	383
	9 AB ..	9	4.92	6.7	1,145	1,700	230	0.00103	583	514
	18 AB ..	18	4.92	7.08	2,421	1,700	500	0.00106	990	481
Siemens ..	S.H. 13a ..	5	4.13	4.72	316	1,850	75	0.00114	242	517
	S.H. 2q ..	9	6.06	7.4	1,920	1,650	420	0.00114	891	490
Walter ..	60 NZ ..	5	4.13	4.72	316	1,400	60	0.00111	225	499
	Vega I ..	5	4.13	4.72	316	1,750	75	0.00135	227	440
	Regulus ..	5	5.32	6.3	720	1,800	185	0.00125	420	450
	85 NZ ..	7	4.13	4.72	442	1,400	85	0.00113	280	478
	Venus I ..	7	4.13	4.72	442	1,750	110	0.00124	291	460
	Castor ..	7	5.32	6.7	1,040	1,750	240	0.00115	550	479
	130 NZ ..	9	4.13	4.72	569	1,600	130	0.00122	365	481
	Mars I ..	9	4.13	4.72	569	1,750	145	0.00128	352	451
Armstrong-Siddeley	Genet ..	5	4.0	4.0	251	2,200	82	0.00138	—	—
	Genet M ..	5	4.25	4.5	318	2,200	103	0.00137	—	—
	Mongoose ..	5	5.0	5.5	539	1,850	155	0.00144	—	—
	Genet M ..	7	4.25	4.5	447	2,200	140	0.00132	—	—
	Lynx ..	7	5.0	5.5	755	1,900	220	0.00137	—	—
	Lynx M ..	7	5.25	5.5	832	2,000	260	0.00141	—	—
	Jaguar ..	14	5.0	5.5	1,512	1,700	416	0.00140	—	—
	Leopard ..	14	6.0	7.5	2,970	1,800	740	0.00139	—	—
Elizalde ..	Double Mongoose ..	10	5.0	5.5	1,080	2,200	342	0.00134	—	—
	Dragon V ..	5	5.12	5.51	565	1,800	165	0.00142	375	442
	Dragon VII ..	7	5.9	5.9	1,129	1,800	320	0.00138	660	469
Fiat ..	Super-Dragon ..	9	5.9	7.48	1,840	1,800	525	0.00139	840	411
	A. 50 ..	7	3.94	4.73	403	1,800	100	0.00121	286	491
Renault ..	— ..	7	3.94	4.73	403	2,000	100	0.00113	308	565
	— ..	9	4.92	5.9	1,009	1,820	250	0.0012	583	493
Hispano-Suiza ..	9 Q ..	9	5.0	5.51	973	2,000	250	0.00117	598	545
S.F.F.A. ..	" B " ..	3	4.14	4.93	199	—	—	—	165	—
	" A " ..	7	4.14	4.93	465	—	—	—	297	—

The data used in the investigation is supplied by Capt. Swan in his review of the Paris show—see AIRCRAFT ENGINEER, February 27, 1931.

At first sight the relationship between capacity and r.p.m. is not apparent, but by dividing b.h.p. by capacity and plotting the result against r.p.m. it was found that for unsupercharged air-cooled engines

$$P = K C N^{.71} \dots \dots \dots (1)$$

where P = normal b.h.p.

C = capacity of engine, cub. ins.

N = r.p.m. at normal speed.

K = constant.

The effect of varying compression ratio is neglected, especially as an increase in compression ratio from 5 to 5.5 only means about 3 per cent. increase in power. A variation of 3 per cent. is obviously outside the accuracy of the formula.

The constant K varies for the different design conditions adopted by each firm, but for any particular firm the variation for their range is small.

Table I gives the value of K and the principal data extracted from Capt. Swan's article. The engines selected are ungeared and unsupercharged.

The biggest range of engine power is provided by the Armstrong-Siddeley engines, varying as it does from 82 b.h.p. for the Genet to 740 b.h.p. for the Leopard.

Even over this large range the value of K only varies between a minimum 0.00132 and a maximum of 0.00144.

The mean value of K for the Armstrong-Siddeley engines is 0.00138, so that the maximum deviation of estimated power from the actual is something less than ± 5 per cent.

In a few isolated cases the constant for some particular engine varies rather a lot from the mean value for the range to which it belongs.

The most notable example is supplied by the Salmson engine 5 AC, which has a value for K of 0.00094, whereas the mean for the Salmson range is 0.00107. This represents a deviation of nearly 20 per cent., although the remainder of the range is fairly consistent.

The actual meaning of the constant K is a little obscure, and is probably greatly influenced by the speed of the induction gases at the design speed.

One thing is certain, that the constant is no indication of the thermal efficiency of the engine; nor is it any indication at all as to the quality of an engine running in a throttled condition.

We can now pass on to the problem of engine weight.

It is rather surprising that it is at all possible to generalise on this subject.

Fig. 1, however, shows that engine weights are mainly dependent upon the total cylinder capacity.

The law for the middle curve drawn is

$$W = 2.93 C^{.763} \dots \dots \dots (2)$$

where W = weight in lbs.

The upper and lower curves show a variation of ± 10 per cent. from the mean curve.

The notable exception to the curve is the Salmson 9 N-CT engine, which, if the published data is correct, weighs 66 lb. less than 9 AC engine, which has the same bore but shorter stroke than the 9 N-CT engine.

No generalised relationships can account for such contingencies.

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By combining equations 1 and 2 it is possible to find the law of engine weight in terms of b.h.p. and r.p.m. Rewriting 1 gives

$$C = \frac{P}{KN^{.71}} \dots \dots \dots (3)$$

Substituting this in 2 gives

$$W = 2.93 \left[\frac{P}{KN^{.71}} \right]^{.763} \\ = \frac{2.93 P^{.763}}{K^{.763} N^{.541}}$$

Since it has been shown that, although K varies with different makes of engines, it is practically constant for any particular make. Without loss of accuracy, therefore, we may write

$$W = \frac{K_1 P^{.763}}{N^{.541}} \dots \dots \dots (4)$$

where K_1 should also be constant for any particular make.

Reference to Table I will show that within fairly close limits this is the case for all normal engines.

The weight per b.h.p. of any engine can then be expressed as

$$\text{weight/b.h.p.} = \frac{K_1}{N^{.541} P^{.237}} \dots \dots \dots (5)$$

Although this article is confined to ungeared engines, mainly on the ground of insufficient data, it is concluded that the addition of gearing adds from 10 to 15 per cent. to the engine weight.

By designing an engine to run at 1,400 r.p.m. instead of 2,100 r.p.m., but giving the same b.h.p., would add 25 per cent. to the weight.

The saving in weight due to fitting gearing of 1 to .667 ratio is from 10 to 15 per cent. of the weight of the engine designed to run at the airscrew speed.

CORRECTION OF AEROPLANE PERFORMANCE TO
STANDARD ATMOSPHERE (DENSITY BASIS).

By CLIFFORD W. TINSON, F.R.Ae.S., M.I.Ae.E.

In submitting the following article for publication in THE AIRCRAFT ENGINEER, Mr. Tinson, who is a member of the technical staff of the Bristol Aeroplane Co., Ltd., states that he fears the article is not very "high-brow," but that his "excuse" for writing it is that he has found that the standard atmosphere is apt to be rather confusing, and he wished to be able to delegate the performance corrections to junior members of the staff.

The following article describes a method of correcting experimental test-flight report figures to standard atmosphere, in which the aim has been to obtain accurate results in the shortest possible time. The standard atmosphere has been taken from the American N.A.C.A. Report, No. 218, "Standard Atmosphere Tables and Data," and the formula for obtaining the time to height from the rate of climb from R. & M. No. 1,316.

Mr. Tinson does not claim that the article contains anything new, or anything that differs materially from the methods commonly employed in performance corrections. He has, however, made an attempt to set down the principles involved in a general way, and a description of the work as it is carried out, keeping the article in simple language for the benefit of anyone who does not yet understand the procedure very clearly.

INTRODUCTION.

THE density of the atmosphere, as of any gas, increases with an increase of pressure, and decreases with an increase of temperature.

It may be generally stated that the pressure and the temperature both decrease as the altitude increases, but the nett effect is a reduction in density as the altitude increases.

Owing to climatic conditions, the pressure and temperature vary from day to day, and consequently the density is not always the same.

The performance of an aeroplane depends on the density of the air because the power output of a normally aspirated (or non-supercharged) engine decreases as the altitude increases. This is due to the fact that a smaller mass is aspirated on the induction stroke as the atmosphere becomes less dense.

A certain minimum horse-power is required in order to maintain level flight, the speed at which flight is maintained under these conditions being fixed by the aerodynamic characteristics of the aeroplane. Any change from these conditions, such as the change of incidence of the wings, demands more horse-power, or the aeroplane would lose height.

If the horse-power is increased by opening the throttle of the engine, the horse-power available in excess of the aerodynamic minimum permits an alteration to wing incidence without loss of height, and thereby endows the aeroplane with a range of speeds over which level flight is possible.

When the attitude of the aeroplane is such that the wings are at the incidence corresponding to minimum horse-power required, but with the throttle opened, the available horse-power in excess of that required to keep the aeroplane in level flight is translated into vertical force, thus giving the aeroplane the ability to climb.

When the aeroplane has climbed to an altitude at which the horse-power has decreased to a value such that the entire horse-power is devoted to maintaining it in level flight, then the aeroplane is said to have reached its absolute ceiling.

The absolute ceiling may be mathematically defined with precision, for it is the altitude at which the rate of climb is zero with full throttle. Owing to the extreme length of time taken to climb the final two or three hundred feet, it is usual to adopt a practical ceiling known as the "Service Ceiling," and this is defined as the altitude at which the rate of climb at full throttle has fallen to 100 ft. per minute.

Variations in atmospheric density not only affect the rate of climb through absolute units of altitude above the aerodrome, but also affect the height of the ceiling, and it is therefore impossible to compare the performances of different flights unless the figures have been reduced to a comparative basis.

For example, if an aeroplane is imagined to have so little power that its absolute ceiling is only 1,000 ft. (indicated) above the level of the aerodrome on a day when the temperature and pressure gave a density value of ρ , and that the next day the density at this aerodrome changes to ρ_1 , on the second day this aeroplane would be capable of reaching, say, 1,100 ft., an apparent increase of 10 per cent. in ceiling.

Its speed range at the aerodrome level would also be slightly increased on the second day.

The percentage difference in performance is generally much less than that given above, which is only intended to illustrate the effect of density changes. Aerodromes, however, are to be found at all kinds of different heights from sea level, so it will be understood that the performance of aeroplanes can only be fairly compared by reducing the observed figures to a definite standard.

The process of reduction is known as the Correction of Performance.

After making careful investigation into atmospheric conditions, varying altitudes, and the different seasons of the year, the National Advisory Committee for Aeronautics of America recommended the adoption of the following values as representative of the Standard Atmosphere, and these were adopted in January, 1925.

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STANDARD ATMOSPHERE.

Standard pressure p_0 to be the pressure exerted by a column of mercury 760 mm. (29.921 in.) in height.

Standard temperature $t_0 = +15$ deg. C. = 59 deg. F.

Standard absolute temperature $T_0 = 288$ deg. C. = 513.4 deg. F.

Standard specific weight $g_p = 1.2255$ kg./m.³ = 0.07651 lb./ft.³

Standard gravity $g = 9.80665$ m./sec.² = 32.174 ft./sec.²

Standard density $\rho = 0.12497 = 0.002378$.

Standard temperature gradient $\alpha = 0.0065$ deg. C./m. = 0.003566 deg. F./ft.

The standard conversion factors are:—

1 metre = 39.37 in. = 3,280.833 ft.

1 kilogram = 2.204622 lb.

Specific weight of mercury at 0 deg. C. = 13595.1 kg./m.³ = 848.7149 lb./ft.³

The above values are taken from the National Advisory Committee for Aeronautics Report No. 218.

It is necessary, then, to correct the observed performance figures of an aeroplane to reduce them to what they would have been had the condition of the atmosphere been "standard" all the way up to ceiling.

To enable this to be done, it is obviously necessary to carry a thermometer on the aeroplane in some position where it will record the general temperature of the surrounding air (not in the cockpit), and to carry an altimeter with a dial locked to show zero feet or metres altitude when the temperature and pressure are standard. Initially, this altimeter must have been put into an exhausting box at a temperature of $+15$ deg. C., in which the pressure of the air is reduced to 760 mm. by pump, and then locked.

It is important to note that performance cannot be reduced to standard atmosphere unless an altimeter such as this, calibrated in an exhausting box and locked, is carried. An altimeter is only an aneroid barometer, or pressure indicator, but is marked in thousands of feet for the convenience of the pilot.

For scientific purposes the indications of the ordinary aircraft altimeter with movable dial mean nothing, as is obvious, for, when the pilot sets the dial to read zero height on starting, the aerodrome itself may be several hundreds of feet above sea level. By calibrating the altimeter as described and locking it, it is transformed into a pure pressure indicator, the zero of which means that the pressure is equal to 760 mm. of mercury.

The air speed indicator, like the altimeter, measures the pressure of the air, but is graduated in miles or kilometres per hour for convenience.

There is a definite relation between the pressure and the speed of flight, and the instrument is calibrated so that it will indicate the correct velocity at ground level, that is, at "standard" ground level. At any other values of temperature and pressure the velocity indicated by the instrument is not true, and must be corrected.

In other words, when the aeroplane is high up and the air is of much lower density, the pressure in the air speed indicator piping is insufficient to displace the diaphragm which actuates the needle to the extent necessary to indicate the true velocity.

The pressure in the pitot tube is proportional to the density of the air and to the square of the speed of the pitot tube through the air, so that it is necessary to

divide the indicated air speed by $\sqrt{\frac{\rho}{\rho_0}}$ where $\frac{\rho}{\rho_0}$ is the relative density, in order to obtain the correct speed.

The relative density is obtained by dividing density at height by density at zero standard feet; these figures may be taken from tables in the N.A.C.A. Report No. 218, quoted above. The relative density at 20,000 standard feet height is 0.5327, so that an indicated air

speed of 130 miles per hour at this height would correct to 178 miles per hour.

At 30,000 standard feet height the density falls to 0.3740, so here, if the true speed were 150 miles per hour, the air speed indicator would show only 91.8 miles per hour.

In addition to this correction for air speed indicator reading, a further correction should be applied which may be important. The air speed indicator will almost certainly be subject to a "position error," due to the proximity of the pitot head to the structure of the aeroplane. As a rule, the instrument in the cockpit gives a lower speed than it should, because of the reduction of velocity at the pitot head due to the strut to which the latter is attached, and to the effect of the wings on the air near the pitot head.

There is no method at present whereby the position error may be calculated, and to find the magnitude of the correction experimentally, it is necessary to carry a second pitot and indicator, the pitot being either suspended below the aeroplane or mounted on a long horizontal mast projecting a considerable distance ahead of the wings, so that it travels in air undisturbed by the aeroplane.

Usually, the indicated air speed as stated in the pilot's report is stated against altimeter height. It is necessary, therefore, to correct the height to standard atmosphere at the same time as correcting the speed for density, and to draw a speed curve so that the speeds may be finally quoted against regular intervals of standard height, such as 15,000, 20,000, 25,000 ft., etc.

When a machine is being put through performance trials, it is usual to carry a recording barograph and a recording air speed indicator. These instruments provide graphic evidence of the performance in addition to the records taken by the pilot.

From the nature of the records made by these instruments, the data available are not generally of a higher degree of accuracy than that provided by the pilot's observations, assuming, of course, that the pilot's figures for altitude have been taken from a calibrated and locked altimeter and not from an ordinary altimeter, and provided that the air speed indicator—if not a specially calibrated instrument for test flying—has been calibrated in the usual manner by means of a column of liquid in a U-tube.

A greater degree of accuracy may be obtainable from the recording instruments when facilities are available for calibrating them with proper laboratory apparatus. As a rule, the height or speed and time scales which are printed on the sheets of paper used to wrap round the revolving cylinders of these instruments are fairly accurate in themselves, but are difficult to sub-divide, and the mark made by the recording pen is too broad for a delicate analysis to be made. Further, unless the apparatus is in the charge of a responsible person, there is no certainty that the base line of the printed sheet is truly horizontal with respect to the spindle of the cylinder.

For these reasons it is generally advisable to consider the recording instruments as independent witnesses only that the required height has in fact been achieved, and that the required speeds have been taken when the machine has been flying level (i.e., not climbing or diving) for a reasonable length of time, and are not instantaneous readings of the air speed indicator.

With this evidence, the pilot's recorded observations may be used with confidence for correction of performance to standard atmosphere conditions.

CORRECTION OF CLIMB.

The data required are as follow:—

- (a) Height from locked altimeter, feet;
- (b) Time to altimeter height;
- (c) Air temperature at altimeter height.

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EXPERIMENTAL TEST FLIGHT REPORT № 594

DATE:- 26.6.30

PERFORMANCE TESTS ON RURITANIAN SINGLE SEATER FIGHTER

MACHINE: PURITANIAN FIGHTER NO 3 (1ST CONTRACT)

ENGINE: URANUS VII A № 7820

PROPELLER DRG NO: A7133/3 DIA 9'-0" PITCH 8'-3 1/2"

WEIGHT AS TESTED: 3464 LBS

BAROMETER:	30	12.5
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COOLING TEMPERATURE: 16 °

REMARKS:- BALLAST CARRIED IN LIEU OF
REMOVABLE MILITARY LOAD EXCEPT ITEMS
IN THE WIND VIZ. NAVIGATION LIGHTS, BOMB
RACK & GENERATORS WERE IN POSITION

FIG. 1

[illegible]

It is also useful to know the engine revolutions during the climb, as these, plotted on the final chart, provide most useful information for record and comparison.

All the above is given in the pilot's test flight report and should be entered up in a table such as the one illustrated (Fig. 1).

In this table it will be noted that there are two columns for temperature, one for observed figures and the other termed "faired."

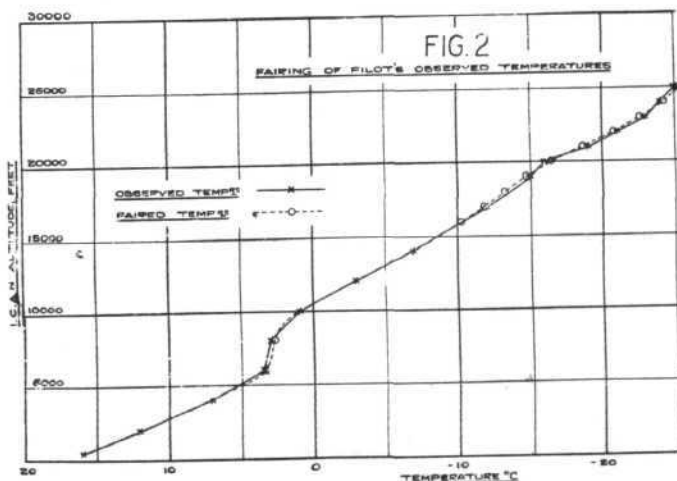
The pilot may be under the disadvantage that he cannot read the thermometer with such accuracy as he can read the other instruments, nor perhaps at the exact moment when the altimeter needle crosses an altitude level, and as it is required to know the temperature fairly accurately to find the equivalent standard height, any slight discrepancies may be smoothed out by plotting the observed figures and then drawing a fair curve through the spots, as shown in Fig. 2. This line should not vary more than about half a degree either way, however, as it is reasonable to assume that the pilot's figures are within that tolerance.

Fig. 2 shows the fairing of the pilot's observed temperatures, and indicates that the fairing is restricted to the limits of possible observational error. The curve is not faired from end to end, as it were.

In passing, any sharp irregularity in the slope of the temperature curve, such as is illustrated, is generally accompanied by waves in the time to climb curve. These usually occur when there are vertical currents in the air which are set up by temperature differences due to clouds, etc.

There may be a temptation to smooth out the time to climb curve when this is the case, but bearing in mind that the purpose of the work is to transpose the times in altimeter height to times in standard height only, and not to try and make a badly-shaped climb curve into a good-looking one, it is advisable to strictly confine any adjustments made by fairing curves to the limits of observational error which a pilot could reasonably claim.

These "faired" temperatures may then be drawn on a curve constructed from N.A.C.A. Report No. 218



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connecting the altimeter reading, the temperature and the equivalent standard height. Then at each altimeter height the equivalent standard height may be read off against the intersection of temperature with altimeter height.

The standard heights corresponding to altimeter readings may then be entered in the table. It is preferable, however, to obtain the standard height with a greater degree of accuracy, and the following equation connecting altimeter height, temperature and standard height may be used for all levels below the lower level of the isothermal atmosphere, viz., below 35,332 ft., or 10,769 m.:—

$$H_s = (1.238 H_a \pm 120 t_o - 1,800).$$

H_s = Standard height in feet.

H_a = Altimeter height in feet (locked altimeter).

t_o = Observed temperature in degrees C.

(The plus sign becomes minus, of course, if t_o is negative.)

Having filled in the equivalent standard heights in the table, the climb in standard atmosphere is known from the time column, but the commencement of this climb is very rarely from zero standard feet. This could only be so if the barometer reading at the aerodrome level was 760 mm. and the ground temperatures + 15 deg. C.

For instance, the commencement of the climb might have taken place when the locked altimeter indicated 200 ft. If the temperature had been + 16½ deg. the start would have been made from a height of + 427.6 ft. in standard atmosphere. If the temperature had been 12½ deg. instead, the start would have been made from a height of - 52.4 ft. in standard atmosphere.

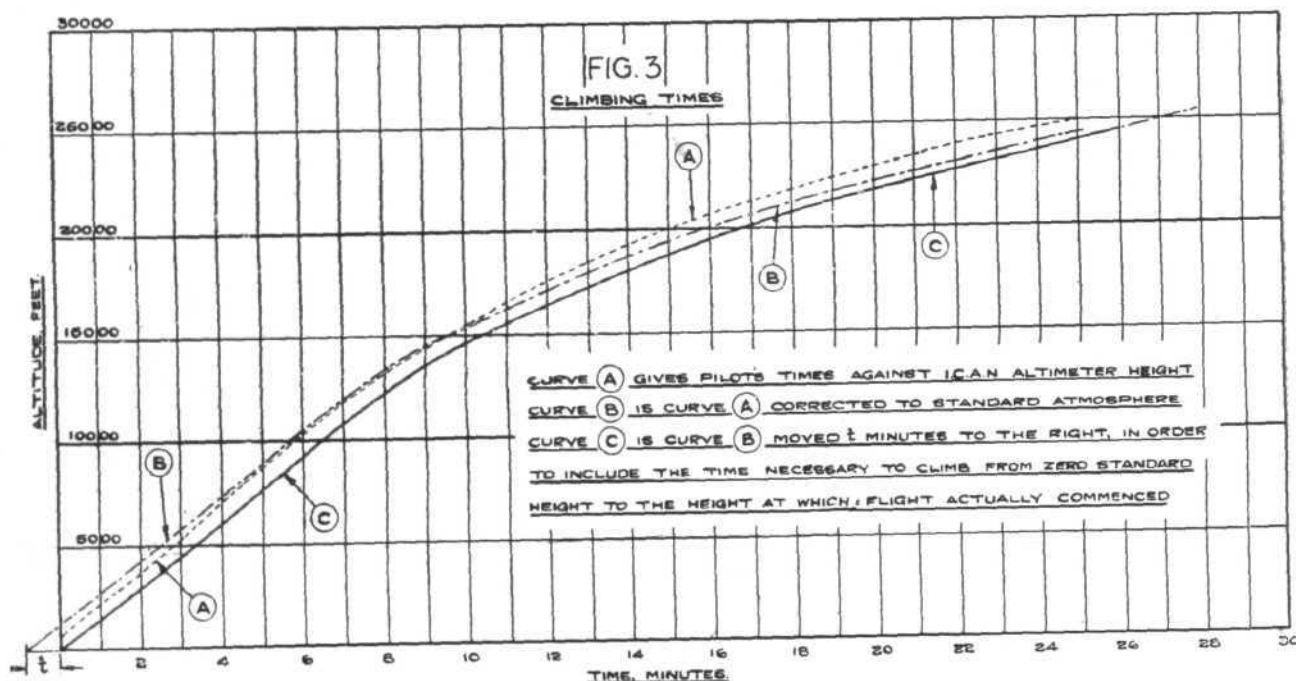
RATE OF CLIMB.

The average rate of climb at various altitudes is very easily calculated from the time climbs to standard heights, but on plotting the results it will usually be found that the points are very scattered, no matter how carefully the previous work has been carried out. It is difficult then to determine at sight a line which represents the rate of climb—and, therefore, the ceiling—accurately. A few trial rate of climb curves will probably be necessary before one is found which, on working back, gives the time to climb figures which agree with the time curve.

In the case of a normally aspirated engine, the rate of climb curve is usually a straight line, that is to say, the reduction of rate from ground level to absolute ceiling is regular. Such an engine, however, may possess features which permit partial maintenance of ground power for the first few thousands of feet, and in such cases it is desirable to check back, after having determined a rate of climb curve which gives the correct time to a height near the ceiling, to verify that it also gives the correct times at heights nearer the ground.

In the case of a supercharged engine, the rate of climb is usually maintained, or even increased, from the ground up to a certain altitude, after which it falls in the normal manner. In some cases, the rate of climb is not maintained, but the fall in rate is not so marked for the first few thousands of feet.

The shape of the curve below the altitude where the fall-off commences to be normal depends on the type of supercharger, etc., and is difficult to determine accurately when the plotted points are widely scattered. The time to the altitude where the fall-off commences to be



From this example it is clear that the curve obtained by plotting climb times against the figures for standard height must be moved across the paper as shown in Fig. 3, so that the curve intersects zero height, which is the same as adding (or subtracting, as the case may be) the time necessary to climb through the number of standard feet separating zero standard height from the point where the climb actually commenced.

It is more convenient, of course, to state the climb times finally as times to regular intervals of standard height. These may then be read off the curve and entered in the appropriate column in the table.

At the foot of this column are spaces in which to enter service and absolute ceilings.

These values are obtainable by plotting the "rate of climb" curve.

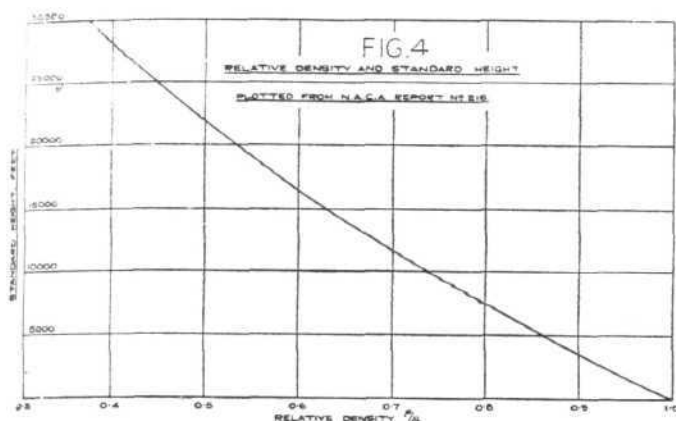
normal can be found fairly accurately, and as the interval times to altitudes below this level are not of very great interest, the precise shape of the curve below this altitude, that is, whether it is a straight line or not, is relatively unimportant.

For this reason, it is advisable to commence by assuming that the rate of climb curve is composed of two straight lines, the one commencing at the ground and going up to what may be called the "supercharge limit," and the other commencing at the supercharge limit and going up to ceiling.

The height of the supercharge limit can be fixed for the preliminary curve by inspection of the engine power curve if available; failing this, the r.p.m. climbing will give a fair indication.

A line must then be drawn through the plotted points

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of rate of climb, terminating at the supercharge limit, and from it the time to supercharge limit calculated and compared with the actual time taken. If agreement is not achieved, the line must be adjusted until its inclination and upward extremity are correct.

Above the supercharge limit, the reduction of rate of climb may be first considered regular, and a trial line run through the plotted points is drawn and the times taken off it as before for comparison with actual times.

(To be concluded.)

A FORMULA FOR THE BUOYANCY OF THE WING FLOATS OF FLYING BOATS AND SINGLE FLOAT SEAPLANES.

By A. R. COLLINS.

The hull and aerostructure of a flying boat, or the main float and aerostructure of a single-float seaplane has, in general, a negative transverse metacentric height in the upright condition so that, in the transverse direction, it is inherently unstable. In this country, the conventional method of providing positive transverse stability is by fitting wing floats, and the following note deals with a simple formula for obtaining the desirable buoyancy of such floats.

Let us first consider the function of a wing float, and how it gives to the aircraft a virtual positive metacentric height in the transverse direction. Referring to the sketch, let

W = the all-up weight of the flying boat or single-float seaplane.

w = the total buoyancy of one wing float.

ab = the water-line in the upright condition.

CD = the water-line when one wing float is completely submerged.

θ = the angle of heel or roll to submerge completely one wing float.

G = the centre of gravity of the complete aircraft.

B and B' = the centres of buoyancy of the hull or main float (with its aerostructure) in the upright and inclined conditions, respectively.

M = the transverse metacentre in the upright condition, i.e., the point where a vertical line through B' intersects the line joining B to G .

GM = the transverse metacentric height of the complete aircraft in the upright condition.

d = the distance from the centre line of the hull or main float to the centre line of a wing float.

Since M is below G , the aircraft has a negative GM in the upright condition, which gives rise to an upsetting moment when the hull is displaced from the vertical. As soon as one wing float touches the water, a righting moment is called into play, which gradually overcomes

the upsetting moment of the hull and aerostructure, and gives to it a virtual positive metacentric height.

Now when one wing float is completely submerged, the upsetting moment of the hull or main float (with its aerostructure)

$$= W.GZ \text{ (where } GZ \text{ is the perpendicular from } G \text{ on to } B'M \text{ produced)}$$

$$= W.GM. \sin \theta.$$

$$= H \text{ (say)}$$

The righting moment of the wing float

$$= w.d. \cos \theta$$

$$= F \text{ (say)}$$

\therefore The reserve righting moment of the wing float

$$= F - H.$$

Hence the ratio of the reserve righting moment of the wing float to the upsetting moment of the hull or main float

$$= \frac{F - H}{H} = R \text{ (say)}$$

$$\therefore F - H = R.H$$

$$= R (W.GM. \sin \theta)$$

$$= W (R.GM) \sin \theta.$$

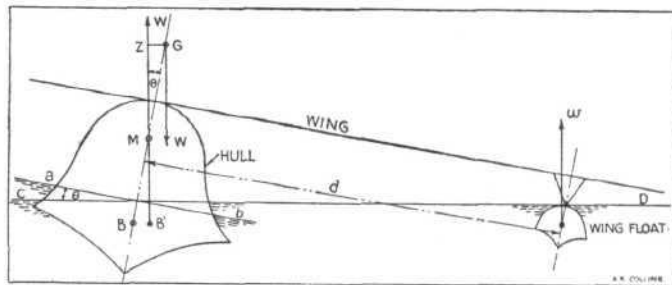
i.e., when one wing float is submerged completely, it gives to the aircraft a virtual positive metacentric height = $R.GM$.

Now a good empirical rule for the transverse metacentric height of a twin float seaplane is

"Transverse metacentric height in feet = $\sqrt[3]{W}$ where W is the all-up weight of the seaplane in pounds."

Hence, to make the stability of a flying boat or single-float seaplane consistent with good twin-float seaplane practice, the virtual positive metacentric height in feet, with one wing float just submerged should = $\sqrt[3]{W}$. In other words, one should aim at the same measure of positive transverse static stability for flying boats and single-float seaplanes, as has been found adequate and desirable for twin-float seaplanes.

Now let h = the negative metacentric height of the complete aircraft in the upright condition. [h will be practically constant for values of θ up to about 10° , which will cover the range of angles of heel or roll, to submerge completely one wing float, for most flying boats and single-float seaplanes.]



When one wing float is just submerged we have (using the same notation as before) upsetting moment of hull or main float (with its aerostructure)

$$= W.h. \sin \theta.$$

Righting moment of the wing float = $w.d. \cos \theta$.

\therefore Reserve righting moment of the wing float

$$= w.d. \cos \theta - W.h. \sin \theta.$$

\therefore The ratio of the reserve righting moment of the wing float to the upsetting moment of the hull or main float

$$= \frac{w.d. \cos \theta - W.h. \sin \theta}{W.h. \sin \theta}$$

$$= \frac{w.d. \cot \theta}{W.h.} - 1 = R \text{ (say).}$$

Now it has already been shown that the virtual positive metacentric height of the complete aircraft with a wing float just submerged = $R.h$, and this should be = $\sqrt[3]{W}$

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$$\therefore \left(\frac{w.d. \cot \theta}{W.h} - 1 \right) h = \sqrt[3]{W}$$

$$\therefore \frac{w.d. \cot \theta}{W} - h = \sqrt[3]{W}$$

$$\therefore w.d. \cot \theta = Wh + W \sqrt[3]{W}$$

$$= W(h + \sqrt[3]{W})$$

$$\therefore w = \frac{W: \tan \theta (h + \sqrt[3]{W})}{d}$$

which gives us a formula for the total buoyancy of one wing float where

w = total buoyancy of one wing float in pounds.

W = the all-up weight of the seaplane in pounds.

θ = the angle of roll or heel, in degrees, to submerge completely one wing float.

h = the negative metacentric height (transverse) of the complete aircraft, in the upright condition, in feet. [It should be noted that " h " will be numerically positive in the above formula.]

d = distance, in feet, from the centre line of the hull or main float to the centre line of the wing float.

It should be noted that considerations of height of wing structure and span and area of wings are factors that should be taken into account in assessing the requirements of the wing float buoyancy for particular aircraft, but the above formula will be found to give satisfactory results for the average conventional types of flying boats and single-float seaplanes.

In the case of small single-float seaplanes (say up to 2,000 lb. all-up weight) operating in sheltered waters, the buoyancy of a wing float given by the above formula may, perhaps, be reduced by about 10 to 20 per cent., depending upon the all-up weight.

In the case of a flying boat or single-float seaplane having a small positive metacentric height in the upright condition, the above formula is still applicable but in this case " h " will be numerically negative when substituted in the formula.

TECHNICAL LITERATURE

SUMMARIES OF AERONAUTICAL RESEARCH COMMITTEE REPORTS

These Reports are published by His Majesty's Stationery Office, London, and may be purchased directly from H.M. Stationery Office at the following addresses: Adastral House, Kingsway, W.C.2; 120, George Street, Edinburgh; York Street, Manchester; 1, St. Andrew's Crescent, Cardiff; 15, Donegall Square West, Belfast; or through any Bookseller.

SPINNING OF A MODEL OF THE FAIREY IIIF. SEAPLANE.

By H. B. Irving, B.Sc., and A. S. Batson, B.Sc. R. & M. No. 1356 (Ae. 487). (15 pages and 27 diagrams.) June, 1930. Price 1s. net.

The object of the experiments was to provide data bearing on the spinning properties of a twin float seaplane and to investigate the effect of various modifications of tailplane on the moments given by the tail in a spin; also to find the effect of differential and floating ailerons and "interceptors" in a spin.

Measurement of rolling and yawing moments due to rolling were made on the model with and without fin and rudder (incidence 22.4° to 60.9°). The fin and rudder gave a moment opposed to the motion at all but the highest incidence, when the moment became positive and reached a value of $1p \times 10^3 = 4.5$.

Of the three forms of aileron control tried, the floating ailerons appear to offer the greatest improvement as regards recovery from a flat spin. Differential ailerons are most beneficial at the lowest incidence (42.4°), but give less rolling moment (body axes) at 60.9° than ordinary ailerons, with, however, some reduction of yawing moment (Figs. 10-12). Similarly, the effect of "interceptors" falls off as the incidence increases and is small at 60.9° incidence. It should be noted, however, that the model was not fitted with slots.

Large positive pitching moments due to the floats were found at high angles of incidence. With elevators hard up (-34.1°) the seaplane trimmed at about 49° incidence as compared with 23.5° incidence when the floats were removed (Fig. 14). Of the total pitching moment due to floats, about one-third is accounted for by interference of floats on tailplane. The floats also reduce the elevator control in the region of incidence 35°-55° (Fig. 15).

The spinning calculations, based on the results of the rolling and sideslip experiments on the model with and without floats, do not indicate that there should be any difficulty in recovery from spinning for the Fairey IIIF seaplane, although the margin of safety in spinning is apparently less than for the corresponding land machine. The nearest approach to danger would appear to be for a steep spin at an incidence not greatly in excess of the stalling angle, but it is in this region that the results of the model experiments may be most liable to scale effect.

DETONATION, MINERAL LUBRICATING OILS AND BLENDED FUELS. By R. O. King, M.A.Sc., and H. Moss, D.Sc. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1362 (E. 44). (11 pages and 8 diagrams.) July, 1930. Price 9d. net.

It was shown by experiments described earlier* that the high anti-knock value given to fuels by the addition of benzole or metallic dope was generally diminished when lubricating oil was distributed throughout the fuel-air mixture during combustion. The several oils used in these experiments were, the vegetable oils, rape and castor, oleine and oleic acid, also fatty oils, but usually derived from animal sources, and mineral oils as represented by two proprietary blends. The detonation inducing actions of the three types of oil differed remarkably, and varied with the substance used to increase the anti-knock property of the original fuel.

The present experimental work was, therefore, undertaken (a) to ascertain the effect on detonation of typical basic varieties of mineral oils, and (b) to investigate the difference in oil effect on plain and doped fuels.

The typical oils used were: Russian No. 1 as a naphthenic base oil, an oil from a Venezuela crude as representing an asphaltic base oil, a light and a heavy distillate from a Pennsylvania paraffin base, and a refined residual oil from the same crude. The fuels were aviation petrol plus benzole or lead dope, and a series of blends made up with varying proportions of paraffins, naphthenes and aromatics. The experiments covered numerous combinations of the various oils and fuels, and were made with induction temperatures ranging from normal to 90° C.

Considering fuels doped with ethyl fluid and used at normal induction temperature, the various oils differ in deleterious action, the asphaltic base oil having the greatest and the paraffin residual (cylinder stock) the least effect. When the induction temperature is raised all of the oils become equally deleterious in effect. With doped fuels in general a given quantity of oil tends to neutralise a definite equivalent quantity of dope as the compression ratio is increased. When the oils are used with undoped fuels the deleterious oil effect increases with the compression ratio at which the fuels are used, within a range of 0.10 ratio, and within this range fuels containing naphthenes in large proportion are less deleteriously affected than fuels containing equivalent proportions of benzole.

Incidentally, it was found that cyclohexane, a naphthenic fuel, was less deleteriously affected by high induction temperature than other undoped fuels given an equal initial anti-knock value by additions of benzole. Further, when cyclohexane was used as a fuel, maximum detonation was obtained at weak mixtures, a characteristic previously thought to be peculiar to doped fuels.

* King and Moss, R. & M. 1318, "Detonation and Lubricating Oil."

MAXIMUM LIFT IN CLOSED AND OPEN JET TUNNELS. By F. B. Bradfield, Math. and Nat. Sci. Triposes, K. W. Clark, B.Sc., and R. A. Fairthorne. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1363 (Ae. 491). (19 pages and 6 diagrams.) December, 1930. Price 1s. net.

The three parts of this report record various tests in connection with tunnel interference on the maximum lift of aerofolts. No general rule has been found governing this effect. The results may be summarised thus:—

(a) The maximum lift coefficient of a slotted wing may be increased considerably by tunnel interference. For a 6 x 36 in. wing, k_1 max., measured in a 4-ft. tunnel, may be greater by 0.1 or more, than when measured in a 7-ft. tunnel.

(b) The maximum lift coefficient of a wing of lower lift coefficient, such as R.A.F.30, R.A.F.32, Aerofol A (a modified form of R.A.F.15) increases with decreasing size of tunnel, but to a much lesser extent. Taking the same comparisons as before, the increase would be 0.025, or a quarter of that found for the slotted wing.

(c) The maximum lift coefficient measured in an open jet tunnel varies little from the free air value.

FLOW OF AIR ADJACENT TO THE SURFACE OF A ROTATING CYLINDER. By E. G. Richardson, B.A., Ph.D., D.Sc. R. & M. No. 1368 (Ae. 495). (12 pages and 18 diagrams.) December, 1930. Price 1s. net.

Measurements of the average velocity and the amplitude of velocity fluctuation close to the surface of a rotating cylinder in a stream in two-dimensional flow at various ratios of stream to peripheral velocity are made, using the methods of R. & M. 1224.*

It is shown that the results are in agreement with the classical theory of the Magnus effect outside the boundary layer, provided a circulation equal to about two-thirds of the theoretical value is assumed. These results are co-ordinated with measurements of lift and drag of the rotating cylinder on a force balance. The variation of skin friction round the surface is compared with the variation of the power required to rotate the cylinder.

The general results are in agreement with a modified form of the circulation hypothesis, having regard to the steep gradient of velocity in the boundary layer round the cylinder.

* R. & M. 1224. "On the Flow of Air Adjacent to the Surface of an Aerofol," by N. A. V. Piercy and F. G. Richardson.

THE ARROW "ACTIVE"

A new all-metal low-power single-seater biplane, designed for transitional training and fighter practice, including advanced aerobatics. The engine is a Cirrus-Hermes type II B inverted four-cylinder air-cooled of 115 h.p. The machine starts at scratch in King's Cup Race.

DURING the last year or so several British aircraft firms have turned their attention to the production of aircraft types intended to form an intermediate step between the dual-control training machine and the high-power single-seater fighter, which a large percentage of service pilots will later be called upon to fly. A feature of all these machines has been low power, with consequent low first cost and very low operating cost in service, which enables an air service using such types to train its fighter pilots and give them constant practice at very small cost indeed.

To the list of British aircraft of this type has now been added the Arrow "Active," with 115-h.p. Cirrus-Hermes II.B inverted engine. This machine has been designed and built by Arrow Aircraft (Leeds), Ltd., the managing director of which company is Mr. A. C. Thornton. Mr. Thornton, it may be remembered, was at one time on the technical staff of the Blackburn Aeroplane & Motor Co., Ltd., and was responsible, under Major Bumpus, for the design of the original "Bluebird," and also to some extent, we believe, for the Lynx-engined Blackburn "Lincock." Possibly this fact may explain certain points of similarity between the "Lincock" and the "Active," a similarity which is somewhat elusive but is unmistakably present.

Constructional Features

In the construction of the Arrow "Active," metal has been used exclusively, except for the wing covering, which is doped fabric.

The fuselage consists of three separate units: the engine mounting, the central part of the fuselage from engine plate to back of cock-pit, and the rear part of the fuselage. The first of these units, the engine mounting, will be referred to when we come to deal with the engine installation.

The fuselage centre structure is practically a *monocoque*, consisting of a skin of duralumin sheet riveted to steel channel longitudinals, carried on frames of tubular and channel members and duralumin box bulkheads. In section the fuselage is pear-shaped, being very narrow at the bottom. The lower wing roots are built integral with the fuselage, the box frames being of very substantial construction.

The rear fuselage primary structure is of triangular section, and consists of three tubular longerons, with the single tube at the bottom. No welded joints are used, a special standardised fuselage joint of extruded tubular and flanged section being employed. All tubular bracing members have socket ends. The fairing members are all of

metal, strongly built and faired to give a good fuselage shape, the lines merging smoothly into the centre structure. The covering of this part of the fuselage is doped fabric.

The biplane wings are arranged as a "sesquiplan," the lower wings being of much smaller span and chord than the upper. In addition, the stagger is fairly pronounced, so that the view is particularly good, further assisted by the downward slope of the deck fairing from windscreen to propeller boss, the inverted engine showing up to great advantage in this respect.

In both upper and lower wings main spars of high-tensile steel are used, the spars being of "figure of eight" section. The end attachment fittings are machined sockets, the sockets and spar fittings being in many cases secured by high-tensile ferrules screwed on high-tensile rods. These ferrules provide large bearing surfaces, and are used in considerable numbers in order to distribute stresses. Drag bracing is by high-tensile swaged tie rods and steel struts of square section.

The wing ribs have booms of drawn duralumin sections, with diagonal braces of tubular section and large area duralumin diaphragms for stiffening. These ribs have been subjected to static loading tests and to 100 hours' vibration tests, and show very large reserve strength factors.

But a single interplane strut is used on each side. This is in the form of a streamline section steel tube, and the ends of the strut are received in special reinforced end fittings of strong box formation, with lug attachments to the internal box ribs between front and rear spars. These box ribs are attached to the main spars by saddle-plate fittings with reinforcing plates attached, and have long bearing surface engagement with their respective spars, being multi-ferruled and bolted to the spars.

The external wing bracing is by streamline wires, and by the use of single interplane struts no incidence wires are used.

The top plane centre-section rests direct on the ridge of the fuselage deck fairing, and with this arrangement a single centre-section strut on each side suffices. This means a considerable reduction in the number and length of struts and wires in the airscrew slipstream, and helps materially to produce a "clean" machine.

A cantilever tailplane is employed, having two continuous tubular spars of high tensile steel and large diameter. The tailplane is provided with incidence adjustment, and is well stabilised at its four points of attachment to the fuselage. The two elevators are built up on a continuous spar tube, and are hinged to the rear spar of the tailplane at five points. The crank levers



ARROW "ACTIVE": This front view shows very well the "clean" design. The engine is a Cirrus-Hermes inverted type II B. Another photograph will be found on p. 715.



THE ARROW "ACTIVE": Rear view. Bristol-Frise ailerons are fitted to the upper wings only.

are box formation. The whole elevator unit is readily detachable.

The fin unit is a cantilever built on a main fin post tube, the lower end of which telescopes into a reinforced sleeve which forms part of the rear fuselage stern fitting. The forward fin member is stayed to the fuselage by a triangular arrangement of tubes inside the fairing, and provides an adjustment whereby the fin unit may be offset in relation to the centre line of the aircraft. The rudder consists of a forward main spar tube and a subsidiary spar tube, to which are secured ribs built up from drawn duralumin boom sections, all ribs in the tail unit being of this type. The outer framing and trailing edge members are made from streamline section steel tube. The rudder is hinged to the fin tube by machined fork fittings. The lower portion of the rudder is shaped in a particular manner to increase the rudder control during such manoeuvres as spinning.

Undercarriage

The undercarriage is of the "split" type, the axles having machined socket fittings hinged to a machined spool on the bottom longeron or keel tube. The two telescopic legs are of the oil and spring type, the landing shock being first absorbed by oil discharging through a diaphragm orifice. There are no welded fittings in the undercarriage, and all sockets are machined and of ample proportions. Grease nipples are provided at all pivot points.

The tail skid is a hinged tubular lever, pivoted in a machined forked fitting, which swivels in bronze bushes carried in a housing which forms part of the bottom end of the main stern post. Shock absorption is by a spring working in compression.

Controls

The flying controls are of normal type, with a duralumin tube control column and adjustable rudder bar provided with parallel action movement. Direct lines of tie-rod controls are employed throughout, and these are guided by felt pad supports mounted in metal box fittings, the felt pads retaining the lubricant.

Engine controls are operated by levers provided with Ferodo friction discs, and are interconnected at the quadrant for the return to normal of the altitude adjustment. Arens units are employed in the engine controls, and are of relatively large size.

Engine Installation

As already mentioned, the power plant fitted as standard in the Arrow "Active" is the inverted Cirrus-Hermes type IIB. It is mounted on resilient engine feet on a tubular structure which gives good accessibility to the rear of the engine. The main structural members are fitted with machined sockets having chamfered barrels

to graduate the change of section. Under running conditions the structure is particularly free from vibration. The engine mounting may be completely dismantled.

Simple gravity feed is employed in the petrol system, a tinned steel tank being mounted in the upper centre-section. A short length of Superflexit pipe line connects with the carburettor through a quickly-detachable filter on the engine mounting. A dirt trap is provided in the tank sump. An oil system of normal type is fitted, with delivery and scavenge pumps connected by short Superflexit pipes to a tinned steel tank mounted on resilient pads on the engine bearers. The tank is provided with cooling tubes and air scoops. An oil thermometer and oil-pressure gauge are provided in the system.

Cockpit

By the particular type of fuselage construction adopted, it has been possible to cut down the sides of the cockpit coaming considerably, so that the pilot may get a particularly unobstructed view. The seat is arranged to take the seat-type parachute, and the seat back is detachable. A very complete set of instruments are provided, and the compass is placed centrally in front of the pilot, above the control column.

Following is a list of the instruments fitted: Compass, airspeed indicator, inclinometer, altimeter, oil thermometer, oil-pressure gauge, and revolution counter.

The equipment further includes: Petrol filter, double-pole engine switch, oil filters, safety belt (Air Ministry approved type), and a set of jury struts for folding the wings.

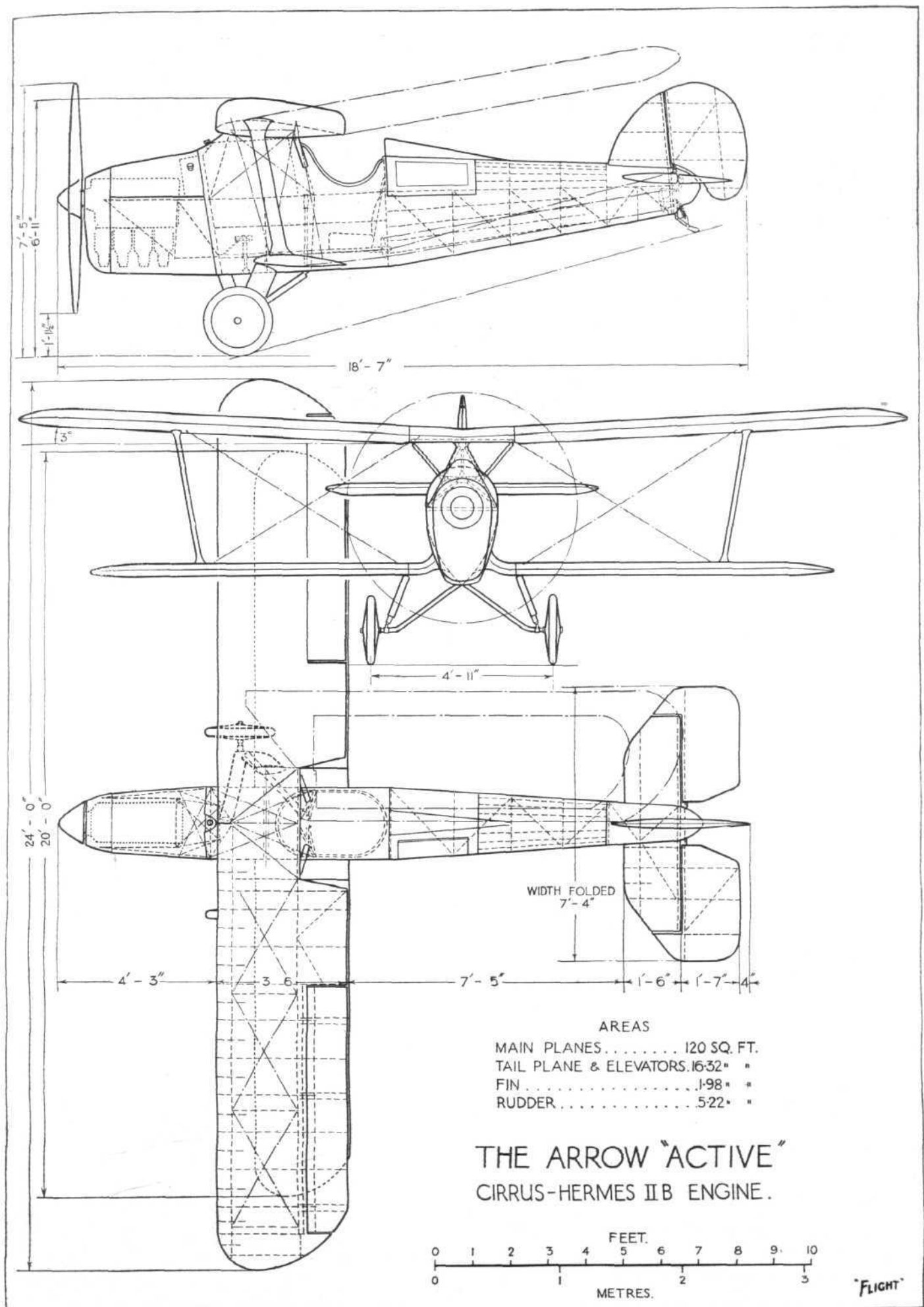
Flying Qualities

The following extracts from the official Air Ministry report on the flying qualities of the Arrow "Active" may be of interest:—

"Aerobatic loading at full weight.—Flight tests with centre of gravity both in extreme forward and rearward positions. The aircraft was put through all normal aerobatics at this weight and centre of gravity positions, and was excellent to handle.

"The controls are light, effective and well harmonised throughout the whole speed range. With the centre of gravity in both extremes, two spins to the left and two to the right were carried out, each of eight turns. The aircraft goes into a spin comfortably and spins smoothly with nose well down, recovery being easily effected by centralisation of controls. The aircraft recovers level flight after a small loss of height. All aerobatics can be easily carried out. Turns to right and left in inverted flight are also easily carried out.

"At this centre of gravity position a controlled stall glide can be executed if the rudder is used to prevent the aircraft dropping a wing. Control at the stall is good.



THE ARROW "ACTIVE": General arrangement drawings to scale.

"The take-off presents no difficulties, control is quickly picked up, and there is no tendency to swing. Landing is easy, there being excellent control at low speeds of approach. The aircraft can be sideslipped easily.

"The aircraft has been inspected for constructional detail in accordance with routine for certificate of airworthiness trials. The aircraft appears to comply in every respect with the requirements for certificate of airworthiness in as far as constructional detail is concerned."

The main dimensions, areas, etc., of the Arrow "Active" are given on the general arrangement drawings. The weight of the machine empty is 853 lb., and the permissible gross weight for the Aerobatics Category Certificate of Airworthiness is 1,210 lb. Application has not yet been made for a Certificate of Airworthiness in

the "Normal" category, but it is likely that this may be granted, if desired, for a gross weight of 1,500 lb., which would be a far greater weight than could be put into the machine, except, perhaps, for very special work.

Performance figures are not yet available. This may have some connection with the fact that the Arrow "Active" has been entered for the King's Cup Race, in which the handicappers have placed it scratch. They evidently have a high opinion of the maximum speed. And presumably Captain Dancy has access to the Martlesham figures!

Readers who desire further information about this little machine should communicate direct with Arrow Aircraft (Leeds), Ltd., Little Russell Street (off Whitehall Road), Leeds. Telephone: Leeds 23124.

Airismas from the Four Winds

Mr. Chichester's Progress

MR. F. C. CHICHESTER, who left Sydney in his Moth seaplane on July 3, on a flight to England via New Guinea, Japan, Alaska and Iceland, reached Manila, Philippines, on July 17. Some damage had been done to his air-screw and one of the floats, but he had effected temporary repairs—mainly with the aid of a piece of petrol tin, tacks and rubber tape!—and managed to accomplish 120 miles on these. Proper repairs were carried out at Manila.

The French Paris—Tokio Attempt

THE Paris Correspondent of *The Times* states that M. Coty, who financed MM. Doret, Le Brix and Mesmin on their attempt to make a non-stop flight from Paris to Tokio, has received a telegram from the airmen stating that their forced landing in Siberia was brought about by the accumulation of hoar frost on the carburettors after a long flight through dense fog. Mesmin and Le Brix, the telegram continues, jumped out with their parachutes, while Doret brought the aeroplane to the ground in the middle of a wood. The crew suffered only slight injuries, but the machine was entirely destroyed. Other reports said that before landing Doret managed to cast off his petrol tanks and thereby prevent the machine from bursting into flames. The airmen are returning to Moscow by the Trans-Siberian railway. M. Coty has announced that he has another aeroplane similar to the *Trait d'Union* ready to

make a new attempt on the long-distance record. If Doret, Le Brix and Mesmin are in a fit physical state they will start again soon after their return, otherwise another crew will be engaged.

Hungarian Atlantic Flight Succeeds

THE two Hungarian airmen, Alexander Magyar and George Entres, who, as reported last week, left New York on July 13 on an attempt to fly across the Atlantic to Hungary, have accomplished their object, and also won the prize of £2,000 offered by Lord Rothermere for the first Hungarian to fly from the United States to Budapest. They left Harbour Grace, Newfoundland, at 1.48 p.m. (local time) on July 15 in their Lockheed "Sirius" monoplane *Justice for Hungary*, and were sighted off Land's End at 7.15 a.m. the following morning, having thus taken 14 hr. for the crossing—a little quicker than the crossing made by Post and Gatty last month. The next news of the airmen came in a telephone message to Budapest at 7.50 p.m., stating that they had made a forced descent, owing to lack of petrol, near Bicske, 30 miles from Budapest. An aeroplane was sent immediately to bring them into Budapest, where they eventually arrived at 9 p.m. They were accorded a stirring welcome by representatives of the Government and a crowd of about 100,000, and later they were driven through streets of cheering people to the Prime Minister's palace, where they were officially received by



A NEW TWO-SEATER FIGHTER: The Hawker "Hart" has now been produced as a two-seater fighter, fitted with Rolls-Royce "Kestrel" super-charged engine, and is taking part in the Air Exercises. (FLIGHT Photo.)

Count Bethleu on behalf of the nation. On July 20, Admiral Horthy, Regent of Hungary, received the airmen and decorated them with the Merit Order of the Third Class, and promoted them both to the rank of captain.

New Schneider Trophy Defender

On July 20 the Vickers Supermarine Works delivered to the British High Speed Flight at Calshot Air Base, the first new Supermarine Rolls-Royce S.6, for the forthcoming International Schneider Trophy Contest. It was towed down Southampton Water on one of the R.A.F. patent launching lighters, specially built for racing seaplanes. On arrival at Calshot, where it was eagerly awaited by the British team, the machine was at once placed in a reserved hangar. Prior to its departure from the works, flotation tests had been carried out, and the Rolls-Royce engine was run up twice. No detailed information of this new defender of the Schneider Trophy has yet been released for publication; it is, however, direct evidence of the generosity of Lady Houston in providing the means whereby it is hoped we shall successfully resist the challenges from Italy and France. Less than two months now remain for practice on the two new Supermarine machines which have been ordered by the Air Ministry, the date of the contest having been fixed for September 12. It may be of interest to note that the White Star Line have made arrangements for their s.s. *Homer* to be the official ship of the Royal Aero Club on the day of the contest.

A Big Fokker Move?

ACCORDING to the *Chicago Tribune* organisation of one of the world's largest aircraft companies, including all of the Fokker interests, into an international combine of major importance in the production of planes, was announced in New York by Anthony Fokker, founder and head of the concern. While Mr. Fokker declined to go into details as to the method to be followed in the amalgamation, it is understood that it is planned to utilise the American and Dutch companies as a nucleus for the merger—an organisation in which the General Motors Corporation will hold a substantial interest through its stock in the American branch of Fokker's operations. Through the vehicle, presumably, of a holding company which is expected to have its headquarters in New York, it is understood that the far-flung manufacturing establishments of the Fokker organisation will be united under one head with a unified management, a step which it is believed will have considerable effect in bringing about operating

savings. According to the announcement the plants in Great Britain, France, Belgium, Italy and the Scandinavian countries would be united with those in Holland and the United States, all having operated separately heretofore. The holding company, it is believed, will continue to be licensed by the Dutch organisation as the individual units have been prior to the present time.

Air Photography in Greece

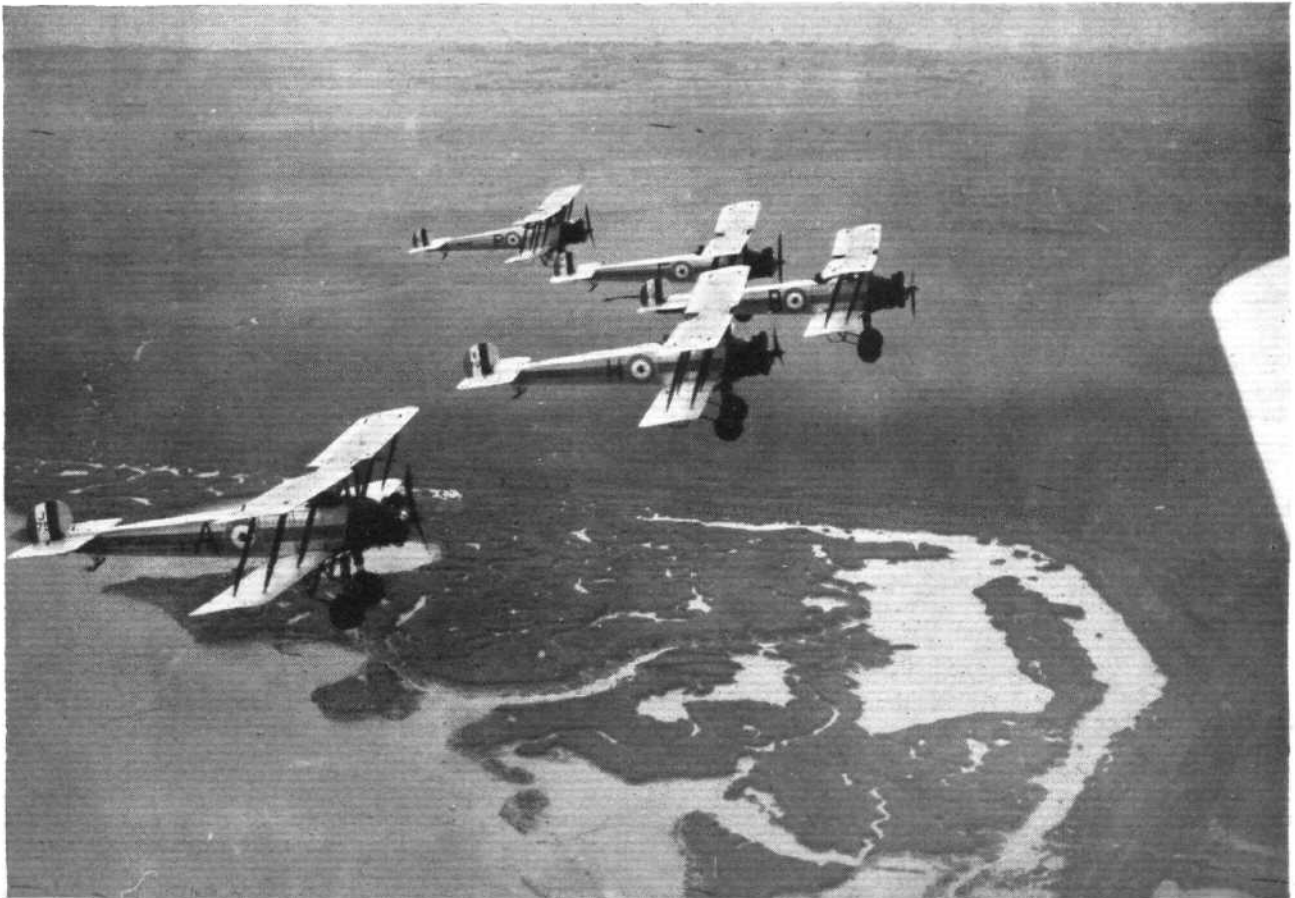
As a result of representations made by The Automobile Association through the Greek Automobile and Touring Club, the Greek Government has agreed that pilots and their passengers may use cameras whilst flying over Greek territory. Greece and Great Britain are the only European countries which allow photography from the air, without a special permit, except over a forbidden area. In the past few months the Greek Government has done a great deal by removing restrictions on flying to make that country one of the pleasantest and easiest to visit by air.

The Australian Sky Pilot

AN interesting story comes from Australia concerning the Rev. Daniels, who owns a Moth. The Rev. Daniels has in his charge the Diocese of Wilcannia, the area of which is 600 square miles. He regularly uses his Moth to cover his diocese. A Clergy Conference of Riverina Diocese was recently called at Hay, N.S.W. The clergy from Wentworth and Balranald, both on the borders of N.S.W. and Victoria, and distanced respectively 180 and 80 miles from Hay, took, respectively, three and four days to reach Hay by road, finally having to abandon their cars owing to boggy roads, and be brought in on the mail coach. The Rev. Daniels reached Hay from Wilcannia in his Moth in 2½ hr., the distance being 250 miles. In his own words: "Comment on the best mode of travelling in outback Australia is needless."

Speeding-up Refuelling

THE process of refuelling aircraft, always laborious, has been considerably simplified by a new type of pump evolved by the Dominion Motor Spirit Co., which is already installed at several aerodromes. The pump is electrically operated, the petrol being fed simply by the depression of a switch, and besides eliminating the labour of the ordinary manual pump, the new apparatus considerably accelerates the process of refuelling. The pump will be of particular value in aerodromes which cater for commercial aircraft where it is desirable to reduce refuelling time to the minimum.



Oxford University Air Squadron is at present undergoing its annual training at Eastchurch. This photograph shows a formation of "Avros" (Lynx) over the estuary of the Thames.

THE AIR EXERCISES

By MAJOR F. A. de V. ROBERTSON, V.D.

THE air exercises to test the defence of London opened at 6 p.m. on Monday evening, July 20. They are to continue until Saturday morning, but operations will only take place between the hours of 6 p.m. and 9 a.m. This gives three periods in each day, evening raids by day bomber squadrons, raids by night bombers, and early day raids. The defence is called Redland and the attack is Blueand, but in exercises of this description the colours have not much meaning.

Though the main interest of the exercises lies in the ability and efficiency shown by the defence, at the start interest centres on the headquarters of the attack, for it is the invaders who have the initiative. I therefore proceeded to Andover, the headquarters of the Wessex Bombing Area, and was fortunate to have some conversation with the A.O.C., Air Vice-Marshal C. L. N. Newall, C.B., C.M.G., C.B.E., A.M. Perhaps "conversation" is not quite the right word, for one of my press colleagues did most of the conversing, and vainly endeavoured to persuade the A.O.C. to give away his plans. It struck me that Air Vice-Marshal Newall would not easily give away anything which he ought to keep, but none the less he told us a good deal that was of interest, and was obviously ready to help the Press in any way that he felt able to do. He said that he intended to do all in his power to outwit the defence, and he laid some stress on the advantage of having the initiative, but what his methods were to be he naturally would not reveal. One of his great problems was to avoid all risk of his squadrons crossing each others' paths when out on raids, and he told us that four corridors had been drawn up for the entry and exit of the bomber squadrons, so as to avoid the chance of their meeting and possibly colliding. He described this as one-way traffic. He said that he was to be informed in advance of the routes which would be followed by the squadrons of bombers attached to the defence, so that he could take similar precautions to avoid the risk of his bombers running into them. In reply to a question (not by myself) he said that if his squadrons did see the defence bombers, they would not attack them. Bombers had no business to begin a fight. Their task was to get to their objective, drop their bombs, and return home. So far as possible they would avoid fighting, though they might have to fight their way to their objective. He admitted that he meant to open the attack with all the weight he could throw into it. If one wanted to end a war quickly one struck as hard as possible at first. Later on some of the squadrons might get tired and need a rest. The weather that evening was bad, and he had already had to alter some of the objectives which he had given to certain squadrons. The two Fairey III F squadrons from Bircham Newton, Nos. 35 and 207 B.S., were originally to have attacked the imaginary docks (actually reservoirs) on Hackney marshes, but the clouds were too low in that direction, so he had directed the two squadrons to make low-bombing attacks on the aerodromes of Hornchurch and North Weald. He might, he said, have to make other alterations before the night was out. Of the methods in which the night bombers would

be used he would say nothing, except that there is no formation flying at night—a fact which spectators of "Hell's Angels" may find it hard to believe. None the less, it is a commonplace of air work.

Air Vice-Marshal Newall explained that his squadrons were not expected to drop bombs unless they could take aim at their targets. To work above clouds and drop bombs on the strength of calculations by instruments would be ruthlessness. Likewise risks must not be taken in peace time, and the machines must keep above 5,000 feet when over London, so that low clouds would render a raid ineffective. In war the bombers would probably fly low over their objectives, but that could not be allowed in peace time. He gave us the list of the targets which had been selected for this year's exercises, namely, Wormwood Scrubs, the West India Docks, Hackney marshes, and the Duke of York's Headquarters in Chelsea. These were targets for high raids. The aerodromes of Hornchurch, North Weald and Northolt were targets for low raids.

As the zero hour of 6 p.m. approached we went out on to the Andover aerodrome, where the two "Hart" squadrons were waiting to start. No. 12 B.S. was to go first, and the engines of the Kestrels were being run up and slowly warmed. When the pilots and gunners climbed into their places I noticed that they wore no Sidcots or overalls or gloves. Their only flying kit was helmets and parachutes. I was told that the cockpits of the "Hart" are so warm that even in winter and at a great height thick clothes and gloves are not needed. The nine machines which made up the formation all carried dummy bombs in their racks and full load of petrol. An umpire went in one of them. A tenth machine flew behind the formation for wireless duties, and carried no bombs. Its duty was to send position reports every 10 minutes. This is done not only to give information to the staff of the Wessex Bombing Area, but also to enable the staff of A.D.G.B. to know exactly how operations on both sides are proceeding.

The heavily laden "Harts" took off well in squadron formation and commenced to climb. The squadron leader then led a rather sharply banked turn, with the result that one of the machines on the inside of the turn had to fall out and regain its position independently. The wireless machine, unhampered by the weight of bombs, flew swiftly round, and evidently could easily have outstripped the formation.

No. 33 B.S. took off about 40 minutes later. Both these squadrons were bound for the Duke of York's Headquarters in Chelsea, which is supposed to be the Redland seat of Government. They were not destined to reach it. The clouds gradually drove them down, and when they were over Horsham and could not climb above 2,000 feet, they very wisely abandoned the raid and turned home. It was disappointing that the first effort of the "Harts" should prove abortive, but next morning they met with more success.

Meantime the two Fairey III F squadrons duly carried out their low-bombing raids on North Weald and Hornchurch. They were engaged by Nos. 29 and 56 Fighter Squadrons (both on "Siskins") and by No. III F.S.



THE BRAINS OF THE BOMBERS: Air Vice-Marshal C. L. N. Newall, C.B., C.M.G., C.B.E., A.M., Commanding Wessex Bombing Area, and two of his staff officers. (FLIGHT Photo.)

("Bulldogs"), and both sides suffered casualties. As six fighters were judged to have been destroyed on the ground, these raids may be counted a success. Two Auxiliary squadrons, Nos. 602 (City of Glasgow) and 604 (County of Middlesex) came over Dungeness to attack the West India Docks, but low clouds kept them off. In fact, on this first evening the stars in their courses fought for the defence. At least the Hebrew poet attributed weather conditions to the stars; prosaic modern communiqués prefer to give the credit to the clouds.

Night brought no peace to the London area. The "Virginias" and "Hinaidis" took up the work. The weather was slowly improving, but did not become really clear until 2 a.m. Consequently raids by machines of Nos. 58 and 99 Bomber Squadrons had to turn back. No. 10 B.S. sent out four "Hinaidis," which all reached the neighbourhood of Wormwood Scrubbs, but their bombs missed the mark. No. 9 B.S. fared both better and worse. Four "Virginias" set out for the Chelsea objective, but the "Bulldogs" of Nos. 3 and 32 F.S. intercepted them. Though the fighters suffered one casualty, two of the "Virginias" were shot down. The other two dropped two tons of bombs, which did considerable damage to Government buildings. On the whole, it was a good night for the raiders.

On Tuesday morning the weather was quite good, and the bombers scored considerable successes. Six squadrons made raids, and two of them got through without being intercepted. The successful squadrons were No. 12 (Herts) and the A.A.F. squadron, No. 604 (County of Middlesex) in "Wapitis." No. 12 B.S. made a terrible mess of the imaginary docks at Hackney Marshes, while the County of Middlesex B.S. did excellent shooting on the West India docks and placed a ton of bombs on it. The other four raids were all intercepted by fighters, but despite casualties they mostly did a good deal of damage. It is regrettable that Nos. 602 and 33 B.S. failed through inaccurate bombing to hit their targets after they had reached them.

It is not wise to pay very much attention to the umpires' decisions on the results of air fighting. They are bound to be very arbitrary and artificial. What we do want to hear is whether the fighters engaged the bombers or whether the latter got through unmolested. It is certainly better for the interests of the defence that the raiders should be intercepted on their way in, before they have dropped any bombs; but one should not make light of a successful attack by fighters when the bombers are on their return journey. In 1918 some very heavy blows were struck at German bombers on return journeys, and their losses on such occasions had a great deal to do with persuading the enemy that the game was no longer worth the candle.

The following Press communiqués were issued by the Air Ministry during the exercises:—

(1)

22.00 hours. Monday, July 20, 1931.—The Air Exercises of the Air Defence of Great Britain Command commenced this evening under varying weather conditions. Showers occurred at many places during the afternoon and early evening, with considerable amount of cloud, but the skies commenced to clear towards evening.

Visibility was good in most places, but in the neighbourhood of London mist and smoke formed locally in the evening.

At 18.00 hours BLUELAND'S ultimatum to REDLAND expired and hostilities commenced.

Two raids consisting of 10 Day Bombers each, approached the West India Dock from the South East but failed to reach their objective.

One raid escaped attack by the fighters of REDLAND but dropped no bombs.

Of the other raid, one aircraft became separated from the formation and was attacked by a Flight of Fighters near BIGGIN HILL. No information is available yet as to damage caused or casualties inflicted.

Two further raids of 9 Day Bombers each, flying below 1,000 feet, approached from the North East via the THAMES and attacked HORNCHURCH and NORTH WEALD aerodromes respectively. The raid on NORTH WEALD was intercepted twice by Fighter Squadrons but no report of casualties has yet been received. The HORNCHURCH raid was also attacked by one of the Fighter Squadrons over the objective.

Two Squadrons of fast Day Bombers of 10 aircraft each, approached LONDON from the West South West, but both were forced to turn back before reaching their objective owing to low clouds and mist.

Altogether eight Squadrons of REDLAND'S Fighters were in action against enemy raiders.

The ground defences also came into action but casualties inflicted by gun fire have not yet been assessed.

(2)

From 21.30 hours Monday, July 20 to 04.00 hours Tuesday, July 21, 1931.—1. BLUELAND attacks on REDLAND were continued during the night of the 20th/21st, although flying conditions were definitely bad. In parts of East and South East England rain fell until shortly after midnight, and the clouds did not break appreciably until 2 a.m.

2. Night bombers approached the "Associated Aircraft Works" at WORMWOOD SCRUBBS on six occasions, but although flying at a low altitude they failed to identify their target. Many bombs, however, were dropped in the vicinity.

3. Attacks were also directed against the REDLAND "Seat of Government" at the DUKE OF YORK'S HEADQUARTERS. Two aircraft reached the neighbourhood, and dropped bombs without damage to Government buildings.

4. On the way to and from their targets the invading bombers were attacked on eight occasions by REDLAND fighters. Results have not yet been assessed.

(3)

Summary of Operations, 18.00 hours, July 20, to 09.00 hours, July 21, 1931.—1. Weather conditions were generally adverse for flying during the evening and the night periods, especially in the eastern part of the Operational Area, owing to low clouds and rain. Conditions improved in the very early morning, which resulted in favourable weather conditions throughout the whole of the area during the morning phase.

2. Period 18.00 hours to 21.30 hours.—Nos. 602 and 604 Auxiliary Air Force Squadrons were directed to attack the WEST INDIA DOCKS by DUNGENESS AND SEVENOAKS, but were unable to reach this objective owing to low clouds. Nos. 35 and 207 (Bomber) Squadrons made successful low-flying attacks on NORTH WEALD and HORNCHURCH aerodromes respectively, each employing nine aircraft. They were engaged by REDLAND Fighter aircraft belonging to Nos. 29, 56, and 111 (Fighter) Squadrons. Two bombers were destroyed and one forced to land. Two fighters were destroyed in air fighting and six were damaged beyond repair on the ground. Further raids were attempted by Nos. 12 and 33 (Bomber) Squadrons, but these did not succeed in penetrating the LONDON Area owing to bad weather.

3. Period 21.30 hours to 04.00 hours.—Night attacks were made by single aircraft of No. 9 (Bomber) Squadron on the REDLAND "Seat of Government" at the DUKE OF YORK'S HEADQUARTERS, and four were intercepted by Nos. 3 and 32 (Fighter) Squadrons. Two night bombers and one fighter aircraft were destroyed in air fighting. Two bombers reached the vicinity of the target, where they dropped 2 tons of bombs, some of which did considerable damage to Government buildings. Attacks were also made by No. 10 (Night Bomber) Squadron on the "Associated Aircraft Works" at WORMWOOD SCRUBBS. Four bombers reached the vicinity, where they dropped their bombs without hitting their target. Nos. 58 and 99 (Night Bomber) Squadrons also attempted raids, but had to return owing to the adverse weather.

4. Period 04.00 hours to 09.00 hours.—During this period six bomber squadrons, of which four were intercepted and engaged by REDLAND Fighters, made low-flying attacks on the LONDON Area. No. 35 (Bomber) Squadron successfully attacked the WEST INDIA DOCKS, dropping 1½ tons of bombs on this target. It was intercepted on its outward journey by No. 111 (Fighter) Squadron, and one bomber and one fighter were destroyed in the air fighting. No. 207 (Bomber) Squadron dropped 1 ton of bombs on the REDLAND "Seat of Government," doing considerable damage. They were intercepted on the inward and again on the outward journey by Nos. 111 and 29 (Fighter) Squadrons. Three bombers were destroyed and three fighters were put out of action. No. 602 (Auxiliary Air Force) Squadron attacked the BECKTON Petrol Depot, but failed to hit this target. They were engaged by No. 54 (Fighter) Squadron, which destroyed three bombers in air fighting, but in doing so lost two of their aircraft. No. 12 (Bomber) Squadron made a very successful attack on the docks (imaginary) at HACKNEY MARSHES. Two tons of bombs were dropped on this objective without loss. No. 604 (Auxiliary Air Force) Squadron also reached the WEST INDIA DOCKS without molestation; six aircraft succeeded in hitting the target, dropping approximately 1 ton of bombs. No. 33 (Bomber) Squadron reached the vicinity of the Depot at KIDBROOKE, but their bombing was inaccurate and no damage was done. The squadron was engaged both on its approach to and return from the target by No. 32 (Fighter) Squadron. Two bombers and two fighters were destroyed in air fighting.

(4)

From 18.00 hours to 21.30 hours, Tuesday, July 21, 1931.—1. Weather was fair generally and visibility good in all districts.

2. Two of BLUELAND'S day bomber squadrons (Nos. 35 and 207 (Bomber) Squadrons) crossed the coast at CLACTON-ON-SEA from a north-easterly direction at about 18.00 hours. Both squadrons attacked the WEST INDIA DOCKS and dropped bombs in the vicinity. They were afterwards engaged by six aircraft of No. 54 (Fighter) Squadron over GRAVESEND. Casualties inflicted have not yet been assessed.

3. A further raid was made by fast day bombers of No. 12 (Bomber) Squadron, which crossed the coast near BOGNOR at about 18.30 hours. Interceptor aircraft of No. 43 (Fighter) Squadron from TANGMERE took off in pursuit, but failed to find the attacking bombers, which were, however, unsuccessfully engaged by No. 19 (Fighter) Squadron. The bombers succeeded in launching a low bombing attack on NORTHOLT aerodrome, but the damage done and casualties inflicted are not yet known.

4. Another squadron of BLUELAND'S fast day bombers, No. 33 (Bomber) Squadron, crossed the coast at 18.30 hours near LITTLEHAMPTON. This squadron was engaged at LEATHERHEAD by No. 23 (Fighter) Squadron, but reached its objective, the REDLAND "Seat of Government" at the DUKE OF YORK'S HEADQUARTERS, and effectively bombed it.

5. Two further squadrons of day bombers, Nos. 602 (City of Glasgow (Bomber) Squadron) and 604 (County of Middlesex (Bomber) Squadron) Auxiliary Air Force, reached the WEST INDIA DOCKS after having crossed the coast at BRIGHTON at about 19.00 hours. They were attacked by No. 3 (Fighter) Squadron over BIGGIN HILL, but reached and bombed their objective.

(5)

From 21.30 hours, Tuesday, July 21, to 04.00 hours, Wednesday, July 22, 1931.—1. BLUELAND attacks on REDLAND were carried on with vigour during the night July 21-22, and, although the weather was mainly cloudy, visibility was good.

2. A series of raids was made by the BLUELAND night bombers of No. 99 (Night Bomber) Squadron against the "DOCKS" at HACKNEY MARSHES between 11 p.m. and midnight. Aircraft crossed the coast singly in the neighbourhood of HASTINGS and RYE at intervals of about 10 minutes, and flew in a northerly direction to the target. The majority of pilots reached the vicinity of the "Docks," and one succeeded in obtaining direct hits.

3. During the same period five BLUELAND bombers of Nos. 9 and 10 Squadrons, acting independently, attacked the "Seat of Government" at DUKE OF YORK'S HEADQUARTERS. Two aircraft of No. 10 (Night Bomber) Squadron dropped their bombs on the objective.

4. A further series of single aircraft raids at about 15 minutes intervals was directed by No. 58 (Night Bomber) Squadron against the WEST INDIA DOCKS between midnight and 1 a.m. These bombers crossed the coast in the neighbourhood of HASTINGS. One aircraft forced landed without bombing, but two others, although intercepted by REDLAND Fighters, succeeded in hitting the target.

Four more were intercepted by REDLAND Fighters from HORNCHURCH and BIGGIN HILL, but dropped their bombs in the vicinity of the target.

5. Single bomber raids by Nos. 9 and 10 Squadrons at approximately 20-minute intervals between midnight and three o'clock approached from the direction of NEWHAVEN and made for the "Associated Aircraft Works" at WORMWOOD SCRUBBS. Seven aircraft bombed the objective, after which clouds at 2,000 ft. prevented further attack. REDLAND Fighters intercepted some of these bombers.

The damage caused by bombs dropped and casualties to both REDLAND fighters and BLUELAND bombers are being assessed.

Air Transport

SIR ALAN COBHAM'S NEW AFRICAN FLIGHT

IN 1927-8 Sir Alan Cobham, it will be remembered, carried out a survey flight round Africa in a Short "Singapore" flying-boat, from which he obtained much valuable information concerning the possibilities of air routes from Cairo to Capetown and along the West Coast. This week we are able to publish some brief particulars of Sir Alan's latest venture, which is also in the nature of a survey flight in Africa.

The object of the present flight is to explore and report upon the possibilities of a new feeder line in the Congo district connecting with the Imperial Airways Cairo-Cape route, to explore a new route for seaplanes through the Mediterranean, and to test out aero-marine alighting places on the Nile.

Sir Alan will also investigate the possibilities of the large twin-float seaplane, such as the Short "Valetta," which is the machine employed in the present flight. Incidentally, also, he will investigate the potentialities of seaplane *v.* flying-boat *v.* landplane.

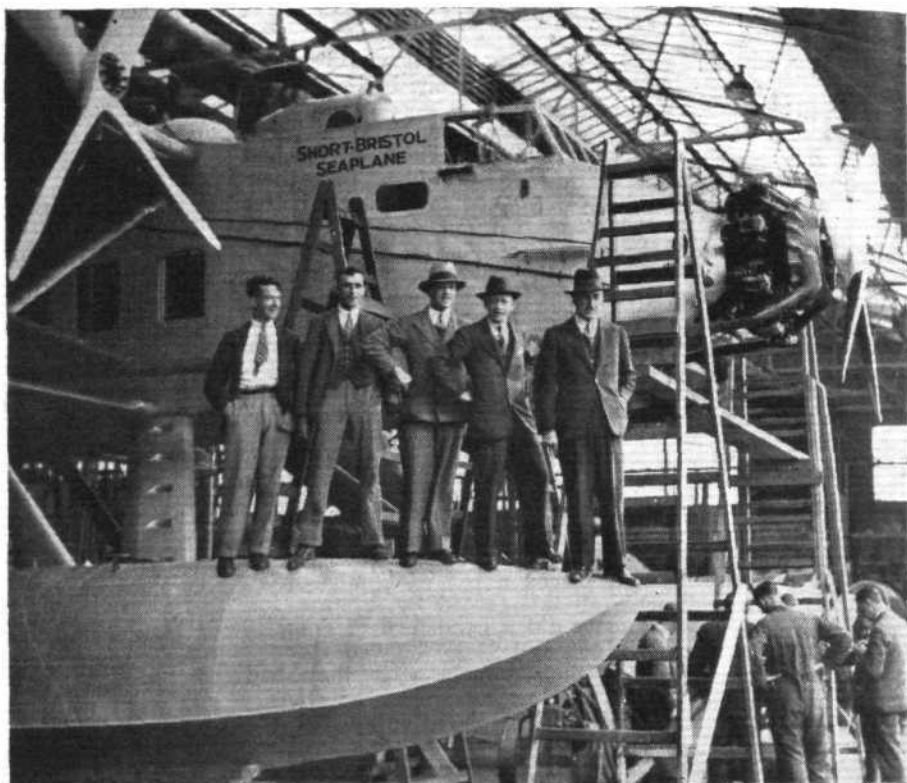
The Short "Valetta" has already fully been described in *FLIGHT* for June 25, 1930, and October 3 last, but it may be repeated here that it is a large all-metal twin-float monoplane equipped with three 490-h.p. Bristol "Jupiter" air-cooled radial engines, and accommodating 16 passengers. The "Valetta" has a span of 107 ft., and a cruising speed of 110 m.p.h.

The flight is sponsored by the Air Ministry—the owners of the seaplane—and supported by Lord Wakefield, who has been associated with previous similar flights, and by a section of the aircraft industry. It will probably take about six or eight weeks, and, in addition to Sir Alan Cobham, who will act as pilot-navigator, there will be a crew of

five, including an engineer-pilot, photographer and wireless operator.

A new route to Africa is being followed, which will be via Corsica, Tunis, Malta, Mirabella and Crete to Alexandria. Thence the route will be by way of the Nile via Luxor, Assuan, Wadi Halfa, Khartoum, Kosti, Malakal, Juba, and Entebbe. On the next stage of the flight they will strike westward to Lake George, Lake Edward and Lake Kivu—which is 5,000 ft. above sea level—flying over the Mountains of the Moon, where "She" and "Alan Quartermain" provided us with many a thrill.

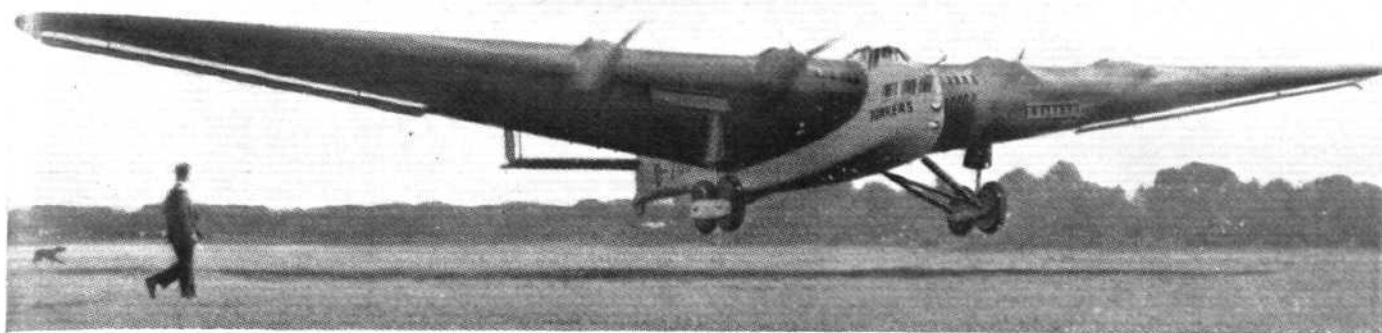
Sir Alan and his crew—which includes the following: F. H. Spencer (the Bristol "Jupiter" engineer), W. Bell (Short Bros.' engineer), A. O. Russell (special photographer) and P. Parish (Marconi wireless engineer)—set out from Rochester at 9.15 a.m., July 22.



SIR ALAN COBHAM'S AFRICAN FLIGHT: Sir Alan, with other members of the crew, standing on a float of the Short "Valetta."



THE SHORT "VALETTA": The large mono-seaplane, fitted with three 490 h.p. Bristol "Jupiter" engines, in which Sir Alan Cobham is making a survey flight to Central Africa. (*FLIGHT* Photo.)



WELL AWAY: A good picture of the giant Junkers "G.38" commercial monoplane taking off during its recent tour of Europe.

South African Airways

THE Senate of the Union of South Africa has given a second reading to a Bill empowering the railways to operate air services. The Minister of Railways and Harbours, Mr. C. W. Malan, speaking in support of the Bill, foresaw that within ten years there would not be a single business man who would not make use of an aeroplane in the course of his business journeys between Johannesburg, Durban and Capetown.

Night Flying in U.S.

SEVEN and a-half million miles were flown at night by mail and passenger lines in the United States last year. On the 2,700-mile coast-to-coast flight of United Air Lines between New York and San Francisco, pilots have the advantage of 111 lighted emergency fields in addition to the many lighted municipal and private airports. There are 16 ports of call for the night air mail-passenger transports between New York and the Pacific Coast. It is claimed that the total night flying in Europe during 1930 was only one-third of that flown by United Air Lines.

A Colombian Air Concession

Modern Transport reports that the Colombian Government has consented to the sale of the "Scatda" (German system of air lines) to the Pan-American Airways, which will

take over and largely extend the whole of their air services in the interior of Colombia. A new long-term concession has been granted, in return for which the Pan-American Airways undertake to inaugurate before the end of the year another air mail service between Bogotá and New York, the journey not to take more than three and a-half days. It is also proposed to establish an air service between Medellín (the second largest town in Colombia) and the Gulf of Urabá, where important harbour works are contemplated. Meanwhile the Government has prolonged the contract with the British member of the Consejo Nacional de Vías for a further period of six months.

An Air Service in Nyasaland

AN air service is to be established in Nyasaland, and the first aeroplane for the service left Johannesburg on July 17 for Blantyre, with Mr. Christowitz, the founder of the service, as passenger. The machine will be christened "Miss Nyasa" by the Governor of Nyasaland. Its chief route will be between Blantyre and Salisbury.

A New Dutch Indies Service

K.N.I.L.M., the Dutch-Indian air line, will start a new weekly service between Singapore and Medan, and *vice versa*, on August 6, as an extension to their present weekly service between Batavia and Singapore.

AIR MINISTRY NOTICES

NOTICES TO GROUND ENGINEERS

It will be seen from the following notice that the Air Ministry Notices to Airmen have been sub-divided in a new manner, and are to be distributed in a different way than hitherto. In view of this distribution and of the increasing size of these notices, as well as those to Ground Engineers and to the increasing pressure on our space, we shall in future not publish these notices in full, but will summarise each notice as it appears. We feel that by so doing we shall be enabled to keep up to date with these, as issued, and readers will, from these summaries, immediately be able to see which notices interest them particularly, and if desired make application for copies to the Air Ministry.

NOTICES TO AIRMEN, SERIES A

No. 37 of 1931. Dropping of cables used for the towing of gliders (117,151/31)

A NOTIFICATION that cables used for towing gliders may be dropped at a height not exceeding 300 ft. and only over a licensed aerodrome, so that the cable falls entirely within the boundaries of the aerodrome and only if the written consent of the controlling authority of the aerodrome has been obtained.

No. 39 of 1931. Examination for Civil Air Navigators' Licences. (110146/31)

NOTIFICATION that an examination for first-class air navigators' licences will be held in London on October 5, 6, 7 and 8, 1931, while an examination for second-class air navigators' licences will be held on October 5, 6 and 7 in London, Heliopolis, and Baghdad. A further examination for second-class air navigators' licences will be held on or about the end of March, 1932.

No. 40 of 1931. Reporting of Aircraft Flying on the Regular Routes. (113151/31)

THE departure and arrival of aircraft operating on regular services in Great Britain, Belgium, France, Germany, Holland, and Switzerland is reported from aerodrome to aerodrome by wireless telegraphy, and other aircraft when flying over a regular route may similarly be reported at the request of the pilot. These should invariably report by telephone to the aerodrome of original destination or to the nearest aerodrome open to public air traffic the news of a forced landing or change of destination.

No. 41 of 1931. Salt End Chemical Works, Hull: Danger Area. (64664/30)

FLIGHT over the works of the Salt End Chemical Works, Hull, at an altitude of less than 1,000 ft., should be avoided. These works are situated $4\frac{1}{2}$ miles E. by S. of the centre of Hull and one mile S.W. by S. of Hedon Aerodrome.

No. 33 of 1931. Engines: Locking Wire for Carburettor Float Mechanism. (99303/31.)

As engine failures have been caused by the breakage of the locking wire in the needle toggle pins of carburettor floats, these locking wires are to be replaced by new material after dismantling.

No. 34 of 1931. Napier "Lion" Engines: Tightening of Nuts on Master Connection Rods. (17765/30.)

Attention is drawn to the special care required when tightening the nuts on master connecting rods studs on "Lion" engines. The makers employ a spring-loaded spanner set to give a maximum of 945 in.-lb. (135 lb. at 7-in. radius). This is to ensure that the bearing cap is securely held with the studs under running conditions without stretching. When such a spanner is not available, a box spanner and tommy bar can be used, the bar not exceeding $7\frac{1}{2}$ in. from the centre of the spanner. In order to secure alignment of the split-pin hole in the stud and the castellation of the nut, the bottom of the nut should be faced off (0.010 in. removed from the face of the nut will allow it to be tightened down $\frac{1}{8}$ th of a turn). A special tool, part No. 48263 is to be used for such an operation. Nuts must on no account be slackened back, but further faced down until the next slot comes into correct position. Split pins must not be more than $\frac{1}{8}$ in. long in the parallel portion, and be correctly opened out so that no movement of the pin can occur. Studs for the master connecting rod are made from steel to B.E.S.A. Specification S. 65. Directions are also given for removing old studs and replacing new ones, which directions must be very carefully followed. Notice to Ground Engineers 28 of 1930 is hereby cancelled. For part N.A. 7028 in paragraph 3 and 5 of Notice No. 32 of 1931, read "Part N.A. 7030."

No. 35 of 1931. Airscrew Designs approved for use in Civil Aircraft. (46117/30.)

A list of the airscrews, together with their design numbers, which are now approved.

No. 37 of 1931. Spartan 2 and 3-seater Aircraft: Aileron Controls under Fuselage. (60361/30.)

It has been found that the aileron controls occasionally foul the bent down bracing lugs at the inner ends of the rear spar on the underside of the lower planes. These bracing lugs are therefore to be removed, since they are redundant. The ball joint, aileron lever and connecting rod have been replaced by new parts obtainable from Spartan Aircraft, Ltd., and must be incorporated in all the aircraft concerned before August 9, in order that certificates of airworthiness may remain valid or may be renewed.

No. 38 of 1931. A Series of Modifications to the Mk. 1 Cirrus-Hermes Engines. (95422/31.)

The first referred to auxiliary cylinder lubrication and a $\frac{3}{8}$ -in. diameter hole has now been drilled in the four plugs in the crank webs. Crankshaft oil retainers and piston scraper rings are also fitted. (2) A strengthened exhaust valve has now been introduced, and should be fitted during the next top overhaul. (3) Exhaust manifold and engine cowling should be modified to the maker's requirements, in order to ensure satisfactory cooling. Drawings for all these modifications can be obtained from the makers.

Correspondence

The Editor does not hold himself responsible for opinions expressed by correspondents. The names and addresses of the writers not necessarily for publication, must in all cases accompany letters intended for insertion in these columns.]

GROUND ENGINEER'S EXAMINATION

[2756] A very interesting, but argumentative, note has been struck by your correspondent, Mr. C. Amherst Villiers, in his statement which infers that the majority of ground engineers are incapable of inspecting an aircraft properly, and backs his argument with the knowledge that G.E. examinations are oral instead of being practical. I would like to ask him does the B.O.T. put their candidates through a practical test when applying for a 2nd or chief's ticket. I could quote other trades and professions, but I shall not just now, however. I am sorry to hear he failed utterly to gain a licence, although he appears to have impressed the examiners very well. I always try to remember that there never was a man who could not meet his superior in anything, and possibly, instead of being examined, he, the candidate, reversed this order of things. I have not held a licence so very long. I am neither an expert nor a very clever engineer, nor was I brought up with a silver spoon in my mouth; but I have a little notion of the abilities of "experts" and "big noises" in every walk of life, and as for a man handling Curtiss OX and Liberty engines in the middle of the war when only 17 years old, and expecting the modern workman to swallow it, that he knew it all, and still does, requires something more than bombastic talk. He then goes on to lecture the Air Ministry on what they should have, such as blus prints, scleroscopes, Brinell meters, etc., at exams. We have not all been brought up at "high school," but he must not forget we, at least, I believe, the majority of us poor mugs, know a little bit about such instruments and their uses; and, perhaps, if I was fool enough, I would like to bet that I have seen some few scientific instruments which he in his travels has yet to do. I would finally ask him to answer whether the United States Department of Commerce do things better, and, if so, are all American licensed G.E.'s cleverer by virtue of holding them. I can recollect travelling the length from New York to Texas, and I saw there some good men, some bad and others middling; and last, but not least, I have been on tour now three months, and I am more in need of a small boat or a pair of gum boots at my inspections than scientific instruments, these would be more useful, and I would, if I dare, mention that Mr. Villiers is far too fast for this country. Lockheed Vegas will convey him to the places he perhaps will get "service."

"OBSERVER."

Malton, Yorks,
June 23, 1931.

AIR SIGNALS

[2757] It may interest a few of your readers to know that I took up with the Air Ministry a modified form of suggested aircraft emergency signals as pointed out in recent letters of mine in FLIGHT. I have now been told that the said Ministry are considering them and have taken up with the G.P.O. one of my suggestions, i.e. "That the name or names of all aerodromes be posted in all telephone booths and in all places where telephones are kept for public use." I am to hear their decision in due course. This will be of vast help to pilots who make forced landings, or who have lost their bearings or wish to deliver an urgent message. Especially will it be useful in cases of serious crashes.

With regard to further precautions for the safety of those who fly, I think it would be excellent if all gasometers bore the name of their towns in large white letters visible at a good altitude . . . as is already the case in some districts. Also, I think it would be excellent if all railway junctions or large stations carried out this idea in some way, and it would also help if other large factories follow the example of the one at Kingston, which displays the name of its town so as to be visible to pilots in their area. Furthermore, it has been pointed out to me what a splendid thing it would be if all golf courses had a part reserved marked with a white ring to indicate a suitable landing place for aircraft in doubt or distress. Incidentally, a golf course not displaying this ring could be taxed £1 per hole per annum, the money to

go to our air services. The pilot landing should, of course, pay a small landing fee, and a fine if he comes down elsewhere than in the prescribed area, for in the latter case he does a large amount of damage to the course. Needless to say, in the case of an unavoidable crash no fine would be paid. The addition of wind cones and landing lights of a special nature would add to the safety of a pilot wishing to make a forced landing, especially at night time if the cones were of the illuminated variety. Also, it seems to me that tall electric light pylons, high factory-chimney structures, etc., should all be illuminated as a warning to night-time pilots who may, owing to atmospheric conditions, be flying at such low altitudes. Wireless masts of the big transmitting stations should also be similarly illuminated.

I should be most interested to know if this has already been done.

MARY KNIGHTLEY.

Golders Green, N.W.11,
May 24, 1931.

THE R.A.F. DISPLAY

[2758] I have just read Mr. A. G. Ryder's letter in FLIGHT regarding the R.A.F. Display at Hendon this last June. Poor old thing; what a grouse he has got—and I came away from Hendon on that memorable Saturday filled with admiration and wonder for all concerned. What matters if it does take one or two hours to get away after seeing such a marvellous show? I never go, nor want to go, there with the intention of going early, so I am never disappointed, and, in fact, stay there for as long as I can. As for the catering there, who cares for food when there is such a grand flying display going on? A parcel of fruit and a bar of chocolate, and what more does one want? And even drink can be brought along if necessary.

Our disgruntled friend seems to expect that everything should be faultlessly arranged; then why did he not do a little arranging himself? I planned to go to Hendon weeks ahead, and booked my seat in the stand. No trouble whatever; all done by post and kindness. Surely such a show is worth 7s. 6d., and not prohibitive for anyone keen and interested in flying.

The weather was perfect on that day; the flying was perfect, and the arrangements were equally as good, considering the huge crowd to be dealt with. Why worry about those fussy individuals who expect to find a restaurant and bar at every turn, and seats *ad lib.*? Aviation does not require the support of individuals who do all they can to hinder the Display authorities rather than help them in a sportsmanlike way, for it is just as important for the crowd to help the arrangements to run smoothly as anyone else. It is not likely that future attendances will suffer in the least by the absence of people whose interests are so easily diverted.

To criticise the faults of such a vast organisation, where only praise and cheers are due, is only petty. Suggestions for improvement would be gladly received, I am sure. And there is no doubt that the Display gets better and better in every way every year. Hats off and three cheers to the R.A.F. Display.

R. E. WILCK.

London, N.W.5.

July 6, 1931.

OVERHEAD CABLES

[2759] I have recently done a lot of flying in the neighbourhood of Castle Bromwich and Luton; in both places there are a great number of "high-tension cables," and at times it is very difficult to even see the standards. But I think if the Air Ministry could persuade the authorities in charge to paint them black and white, instead of being a danger they might act as a guide.

V. N. DICKINSON.

P.S.—I understand that cables have not yet been constructed which will carry enough load to enable the current to be carried underground, i.e., in the case of the very high voltages.

Dunstable Downs, Beds,

THE CIRCUIT OF ITALY

AT 5 a.m. on July 17, Sig. Mussolini started off the first machine from Rome in the Circuit of Italy air race, which is being flown over six stages covering the whole of Italy, from north to south, and totalling, in all, some 5,885 km. (3,657 miles). The six stages are as follow:—(1) Rome—Palermo (1,071 km.); (2) Palermo—Rimini (1,175 km.); (3) Rimini—Venice (1,104 km.); (4) Venice—Milan (1,113 km.); (5) Milan—Turin (491 km.); (6) Turin—Rome (931 km.). Between each control there are compulsory stops and turning points.

The original entry numbered about 42 competitors, representing Italy, Great Britain, France, Belgium, Germany and Switzerland, out of which about 37 started, and 21 completed the first stage. At the time of writing, we have not received the final list of entries, but hope to publish this, with details of the race, later.

According to reports so far received, there are three British pilots in the race, Capt. H. Broad, who is flying a D.H. "Puss Moth" in the "grand tourist" section, Mr. John Carberry, in a Monocoupe (Walter engine), and Mr. Balfour.

The first to arrive at Palermo was Sig. Ambrogio Colombo, on a new Breda 33 low-wing monoplane, who completed this section in 6 hr. 14 min., at an average speed of 112 m.p.h. Sig. Meleri, on a similar machine, came in second, 25 min. later, while third and fourth places went to the German pilots, Poss and Lusser, both on Klemms. Capt. Broad arrived second in his category. Mr. Carberry, who was last to leave Rome, was forced to return owing to a broken oil pipe.

One of the Fiat A.S.1 monoplanes, piloted by A. Pallavicini with Sig. A. Donati (a brother of Renato Donati), crashed while flying low over Naples, Donati being reported killed and Pallavicini seriously injured. Another report stated that another Fiat A.S.1, piloted by Umberto Carrera, fell in the sea near Cape Santa Lesscon, both pilot and passenger being drowned.

As the Breda 33, referred to above, is an entirely new model produced by this well-known Italian firm, perhaps a few notes regarding it may be of interest before concluding our brief report on the "Circuit."

The Breda 33, which has been designed for high-speed touring, is a low-wing monoplane fitted with an inverted



Sig. ing. Ambrogio Colombo, who was the first to arrive at Palermo on a Breda 33 monoplane.

D.H. "Gipsy III" engine. It has a maximum speed of 144 m.p.h. and a cruising speed of 125 m.p.h., at which the petrol consumption comes out at about 18 lb. per 60 miles. Exceedingly severe tests were carried out by the Registro Italiano before the acceptance of this machine, both constructionally and under all flying conditions. It is a two-seater (dual control) with comfortable and well-equipped cockpits in tandem. Special transparent windows, which slide down into the sides of the fuselage, can be raised or lowered during flight so that the cockpits can be entirely enclosed or open, as desired. We hope to give a detailed description of this machine later.



HIGH AND LOW: Two types of monoplane in the Circuit of Italy race. Above is Capt. H. Broad's D.H. "Puss Moth" and below is the new Breda 33 ("Gipsy III") low wing monoplane.

INSTRUCTORS' CERTIFICATES

THE Guild of Air Pilots and Air Navigators of the British Empire has for some time had under consideration the question of unqualified flying instruction. So long ago as November, 1930, it was ascertained that there was general agreement as to the undesirability of flying instruction being given by unqualified or insufficiently experienced persons.

In the spring of this year a letter signed by the Chief Instructors of the principal flying schools and clubs in the country appeared in *The Times*, calling attention to the growing seriousness of this matter.

Since that time the Court has referred the whole subject to a special Committee in the following terms:—"To examine and report upon the present conditions regarding the qualification of Civil Flying Instructors, and to make any recommendations that might be desirable."

The Committee consists of: R. A. de Haga Haig (Chairman), the Deputy Master Capt. the Rt. Hon. F. E. Guest, M. Findlay, C. A. Pike, C. R. McMullin, V. H. Baker, H. D. Davis, the Clerk.

Arising out of this report, the Court have decided that the Guild will issue a Certificate of Qualification open to all those following or adopting the profession of Instructor. Regulations have, therefore, been submitted to, and approved by, the Chief Instructors in this country, and subsequently by the Court. A copy of these are annexed.

Every endeavour has been made to keep the expense to a candidate to the minimum. The Guild will provide the Examiners, who will voluntarily undertake the work without remuneration, and the flying clubs and firms giving instruction will lend aircraft at cost price.

The Guild's Certificate is backed by the insurance interests.

The following constitutes the Panel of Examiners so far appointed.

Name.	Description.	Area.
J. Houston	Chief instructor, Scottish Flying Club.	Scotland.
A. M. Kingwill	Chief instructor, Northern Air Lines	North-West.
A. G. Loton	Chief instructor, Brough	North-East.
C. F. Uwins	Bristol Aeroplane Co., Ltd.	South-West.
F. W. Reeve	De Havilland Aircraft Co., Ltd.	
V. H. Baker	Chief instructor, Airwork, Ltd.	London.
M. Findlay	Chief instructor, National Flying Services	
H. D. Davis	

Further Examiners will also be appointed for Northern Ireland and elsewhere, as required.

The Court realise that nothing can, or should, stop one friend instructing another on a privately-owned aircraft, but they consider that a man who receives payment for

professional services should be able to produce evidence of a definite standard of qualification.

These proposals will apply to existing members and Associates of the Guild, and those of them who are practising as Instructors are urged to support the scheme by applying without delay for the Guild Certificate. The Certificate will also be available to non-members of the Guild. The Guild's scheme has been laid before the Air Ministry, with detailed recommendations as to the amendments in existing regulations required to make the Certificate compulsory.

The following is a list of firms who have agreed to co-operate to date:—Messrs. Airwork, Ltd.; North Sea Aerial & General Transport, Ltd.; Brooklands Aviation, Ltd.; Messrs. Phillip & Powis Aircraft, Ltd. (Reading); Southern Aircraft, Ltd.; National Flying Services, Ltd.; the Liverpool and District Aero Club; the Bristol Aeroplane Co., Ltd.; the Midland Aero Club; the Hampshire Aeroplane Club; Air Service Training, Ltd.

The scheme will come into operation on August 1.

REGULATIONS GOVERNING THE ISSUE OF CERTIFICATE

SCHEDULE I

1. There will be a test consisting of (a) oral examination, (b) flying test, for all candidates for original certificate, subject to the discretion of the examiner, as hereinafter mentioned.
2. The certificate will be signed by the master or deputy master and countersigned by the examiner and the clerk, and will normally be in force for 12 months from the date of issue. Renewals of certificate will be endorsed on the original signed by the clerk.
3. The test will be carried out by a single examiner selected by the Court of the Guild from its panel. There will be a right of appeal by a dissatisfied candidate to a board of two examiners (other than the examiner who turned the candidate down), whose decision shall be final. If they both agree, his appeal will be allowed; if they disagree, his appeal is disallowed.
4. The candidate will be required to deposit a sum of £5 on giving notice of appeal, which will be refunded if the appeal is allowed.
4. Applicants for renewal of instructors' licences will have to show a minimum of 50 hours' instructional flying during the preceding year, or have to pass the test previously referred to, subject to the discretion of the Guild.
5. The charge made by the Guild to members and associates for test will be the minimum required to cover office expenses, and at the outset will be 10s. The charge for renewals will be not more than 5s. if no flying test is necessary.
6. Candidate to pay cost of hire of aircraft for test. Total cost, including Guild's fee, hire of aircraft, not to exceed £2 2s. for original certificate. No fee will be payable to the examiner.
7. Charge to non-members will be increased by £2 2s.
7. Examiner's discretion. The examiner may look to available private records, such as C.F.S. certificate and underwriters' private records, to guide him in dealing with original applications for certificate or renewals when less than 50 hours' instruction time shown, and may exempt a candidate from test.
8. The Guild will maintain a register of the instructors' certificates issued. A warning will be sent to each holder approximately one month prior to the date of expiry.
9. A meeting of the panel of examiners must be convened forthwith after their appointment for the purpose of enabling them to arrive at a uniform standard of examination. They must also determine at what intervals of time they will subsequently meet.
10. The court may at any time withdraw a certificate during its currency.
11. Examiners on the panel shall retire annually, but shall be eligible for re-election by the Court. The Court may also remove or replace an examiner at any time.

Investigation of Two Civil Air Accidents

WE have received from the Air Ministry the following report on two civil air accidents:—

I. The Inspector of Accidents has completed his investigation of the accident to an Avro aircraft, owned by a civil aviation firm, which crashed in the garden of a house in South-East London on February 2 last. The aircraft was wrecked and the pilot and passenger were seriously injured. The aeroplane had been chartered, together with two "Moths," for the production of a film, and was carrying the cinematograph operator and camera. The flight, which started from Hatfield aerodrome, had occupied a little over half an hour and was being conducted above a large expanse of cloud, when the aeroplane in question left the other machines and made a forced descent, the engine ceasing to function. It appears from the Inspector's conclusions that the forced descent through cloud was due to the engine running short of petrol from the main tank and the pilot subsequently failing to allow sufficient time for the supply from the reserve tank to become operative. Further, the pilot had failed to verify the quantity of petrol in the tanks before commencing the flight. He had been summoned to undertake the flight at very short notice so as to get the benefit of certain cloud conditions specially appropriate to the film which was being taken,

and the omission to check the petrol was due to this urgency and the fact that he had some reason to believe that the tanks were full.

II. The Inspector of Accidents has completed his investigation of the accident to an aircraft known as the *Angus Aquila*, privately owned, which crashed at Hanworth Aerodrome on March 21 last. The pilot, who was also the designer and owner, was killed. The aeroplane—a single-seater, low-wing monoplane—was designed and built privately during 1930. Up to the day of the accident the aeroplane had been flown within the precincts of the aerodrome on three or four occasions for periods of about ten minutes, but it had not yet been approved for a certificate of airworthiness. It appears from the Inspector's conclusions that on March 21 the aeroplane took-off in the early afternoon, climbed to a height of about 100 ft., and then started to turn left over the borders of the aerodrome. This turn very quickly developed into a spiral nose-dive or incipient spin and the machine dived to the ground. The Inspector of Accidents found that no part of the main structure had failed in the air, and that, although the flying qualities of this experimental aircraft may have differed somewhat from those of an aircraft of normal type, the accident was due to the pilot's attempting to execute a sharp turn near the ground and mishandling the controls when doing so.

CHANGES IN THE ROYAL AIR FORCE HIGHER COMMAND

THE Air Ministry announces the following appointments:—

Air Marshal Sir Edward Leonard Ellington, K.C.B., C.M.G., C.B.E., to be Air Member for Personnel on the Air Council, in September, 1931, *vice* Air Vice-Marshal Tom Ince Webb-Bowen, C.B., C.M.G.

Air Marshal Sir William Geoffrey Hanson Salmond, K.C.B., K.C.M.G., D.S.O., to be Air Officer Commanding-in-Chief, Air Defence of Great Britain, in September, 1931, *vice* Air Marshal Sir Edward Leonard Ellington, K.C.B., C.M.G., C.B.E.

Air Vice-Marshal Cyril Louis Norton Newall, C.B., C.M.G., C.B.E., A.M., now Air Officer Commanding, Wessex Bombing Area, Air Defence of Great Britain, to be Air Officer Commanding, Royal Air Force, Middle East, with effect from October 12, 1931, *vice* Air Vice-Marshal France Rowland Scarlett, C.B., D.S.O.

Air Vice-Marshal Tom Ince Webb-Bowen, C.B., C.M.G., to be Air Officer Commanding, Wessex Bombing Area, Air Defence of Great Britain, in September, 1931, *vice* Air Vice-Marshal Cyril Louis Norton Newall, C.B., C.M.G., C.B.E., A.M.

Air Vice-Marshal Robert Hamilton Clark-Hall, C.M.G., D.S.O., to be Air Officer Commanding, Coastal Area, Royal Air Force, with effect from October 1, 1931, *vice* Air Vice-Marshal Sir Charles Laverock Lambe, K.C.B., C.M.G., D.S.O.

Air Commodore Norman Duckworth Kerr MacEwen, C.M.G., D.S.O., to be Air Officer Commanding, Royal Air Force, Halton, with effect from October 1, 1931, *vice* Air Commodore Ian Malcolm Bonham-Carter, C.B., O.B.E.

Air Commodore Arthur Wellesley Bigsworth, C.M.G., D.S.O., A.F.C., to be Director of Equipment at the Air Ministry, with effect from October 1, 1931, *vice* Air Vice-Marshal Robert Hamilton Clark-Hall, C.M.G., D.S.O.

Air Marshal Sir Edward L. Ellington, K.C.B., C.M.G., C.B.E., joined the Royal Flying Corps from the Royal Artillery in 1913. He held staff appointments in France from the beginning of the war until 1917, when he was appointed Deputy Director of Military Aeronautics at the War Office. He became Director General of Military Aeronautics in 1918, and shortly after was appointed Controller General of Equipment at the Air Ministry. On the reorganisation of the Air Ministry in February, 1919, he became Director General of Supply and Research, with a seat on the Air Council. For his services in the Great War he received the awards of C.B., C.M.G., and C.B.E., and was mentioned in despatches on three occasions, besides having several foreign orders bestowed upon him. He was appointed K.C.B. in the Birthday Honours List of 1920. He proceeded to Egypt in 1922 to take over command of the Royal Air Force, Middle East, relinquished this command in 1923, on appointment as Air Officer Commanding, Royal Air Force, India, and in turn became Air Officer Commanding, Royal Air Force, Iraq, in November, 1926, and Air Officer Commanding-in-Chief, Air Defence of Great Britain in January, 1929. He was promoted to the rank of Air Marshal in July, 1929.

Air Marshal Sir W. G. H. Salmond, K.C.B., K.C.M.G., D.S.O., joined the Royal Flying Corps from the Royal Artillery in 1913. During the Great War he commanded a squadron and wing of the Royal Flying Corps in France before taking over command of the Royal Flying Corps in the Middle East, and received the awards of K.C.M.G., C.B., and D.S.O. In addition he was mentioned in despatches six times, specially mentioned by the Secretary of State for War, and had several foreign Orders bestowed upon him. He was granted a permanent commission in the Royal Air Force in 1919, and was later appointed Air Member for Supply and Research on the Air Council, which post he held from 1922 until 1926, when he became Air Officer Commanding, Royal Air Force, India. In the New Year's Honours List of 1926 he was appointed K.C.B., and was promoted to the rank of Air Marshal in July, 1929.

Air Vice-Marshal C. L. N. Newall entered the Army in 1905 as Second Lieutenant, Royal Warwick Regiment, transferred to the Indian Army in 1909, and joined the Royal Flying Corps in September, 1914. During the war he commanded a brigade of the Royal Flying Corps and Royal Air Force in France, and in addition to being awarded the Albert Medal for conspicuous gallantry in January, 1916, received the C.M.G. and C.B.E., was mentioned in

despatches on three occasions, and had several foreign decorations conferred on him. After the war, Air Vice-Marshal Newall served as Chief Staff Officer, South Eastern Area, and also held the post of Deputy Director of Personnel, Air Ministry. He was Air Aide-de-Camp to His Majesty the King during 1923-24, and after promotion to the rank of Air Commodore in January, 1925, was appointed Air Officer Commanding, Headquarters, Special Reserve and Auxiliary Air Force. Subsequently he was employed on special duty with the League of Nations Disarmament Committee, and, on completion of this duty, became Director of Operations and Intelligence, Air Ministry, and Deputy Chief of the Air Staff in April, 1926. He was appointed a Companion of the Order of the Bath in the Birthday Honours List, 1929, and in the New Year Honours List, 1930, was promoted to the rank of Air Vice-Marshal and made an additional member of the Air Council. Since February, 1931, he has commanded the Wessex Bombing Area, Air Defence of Great Britain.

Air Vice-Marshal T. I. Webb-Bowen, C.B., C.M.G., joined the Royal Flying Corps from the Bedford Regiment in 1912, and, on the outbreak of the Great War, was appointed Assistant Commandant at the Central Flying School. In 1915 he proceeded to France, and commanded No. 3 Wing of the Royal Flying Corps, and later No. 2 Brigade in France and No. 7 Brigade in Italy. For these services he received the awards of C.B. and C.M.G., besides being mentioned in despatches six times and having several foreign decorations bestowed upon him. He was granted a permanent commission in the Royal Air Force in 1919, and, after commanding the South Eastern Area, Royal Air Force, became Air Officer Commanding, Royal Air Force, India. In 1924 he became Air Officer Commanding, Inland Area, and two years later Air Officer Commanding, Royal Air Force, Middle East, after being promoted to the rank of Air Vice-Marshal. Since the beginning of 1930 he has held the appointment of Air Member for Personnel on the Air Council.

Air Vice-Marshal R. H. Clark-Hall, C.M.G., D.S.O., joined the Royal Flying Corps (Naval Wing) from the Royal Navy in 1914. During the Great War he commanded various units operating at Dunkirk and with the Grand Fleet, and received the awards of C.M.G. and D.S.O., in addition to being mentioned in despatches. He was appointed to a permanent commission in the Royal Air Force in 1919, and assumed command of No. 29 Group, Royal Air Force, and was later appointed an instructor at the Royal Air Force Staff College. In 1924 he proceeded to Egypt, where he commanded the Egyptian Group and served on the Headquarters staff of the Royal Air Force, Middle East. He held the post of Air Officer Commanding, Royal Air Force, Mediterranean, from 1925 until 1929, when he was appointed Director of Equipment at the Air Ministry. He was promoted to the rank of Air Vice-Marshal in July, 1929.

Air Commodore N. D. K. MacEwen, C.M.G., D.S.O., joined the Royal Flying Corps from the Argyll and Sutherland Highlanders in 1916, and served during the Great War in Salonika, Egypt, and Mesopotamia, receiving the awards of C.M.G. and D.S.O., besides being mentioned in despatches. He was appointed to a permanent commission in the Royal Air Force in 1919, and subsequently commanded the Royal Air Force in Palestine and Trans-Jordan. In 1926 he was appointed Deputy Director of Training at the Air Ministry, and in 1929 he was promoted to the rank of Air Commodore, and assumed command of No. 22 Group, Royal Air Force.

Air Commodore A. W. Bigsworth, C.M.G., D.S.O., A.F.C., joined the Royal Flying Corps (Naval Wing) in 1913, and served with the Royal Naval Air Service in the Great War, during which he destroyed single-handed a German submarine on August 26, 1915, by bombs dropped from an aeroplane operating from Dunkirk. For this and other distinguished services he received the awards of C.M.G., D.S.O., and A.F.C., and was mentioned in despatches. He was appointed to a permanent commission in the Royal Air Force in 1919, and subsequently commanded in succession the Armament and Gunnery School, Eastchurch, the Royal Air Force in the Mediterranean, and the Royal Air Force Base, Leuchars. After serving as Chief Staff Officer at Headquarters, Coastal Area, he assumed command of No. 10 Group, Royal Air Force, in November, 1929, and was promoted to the rank of Air Commodore in January, 1930.

Book Review

THE FATHER OF THE RIGID*

IT is not generally known that Count Ferdinand von Zeppelin had this in common with British airman, that both, at different times, fought against the Prussians. Zeppelin was a Württemberger, and an officer in the army of that kingdom. In the war of 1866 Württemberg was on the side of Austria against Prussia, and Zeppelin took part in the campaign. In fact, he distinguished himself by swimming in full uniform across a rapid river to carry a message to troops on the other side. This campaign, however, was not his first taste of war. Previously he had been sent as an accredited observer with the Federal Army in the American Civil War, and is believed to have taken part in a cavalry charge. He did this, however, with an easy mind, for he carried in his pocket a letter of introduction to General Lee, which might have helped him had he been taken prisoner.

Zeppelin was, in fact, from his earliest years, an unusual combination of a student and a dare-devil adventurer. When he first entered the army, his brother officers thought him more of a student that befitted an officer, but presently his feats of daring filled them with admiration.

After the German Empire came into being, Zeppelin became a diplomat. He was appointed Württemberg representative at Berlin, and he is supposed to have annoyed the Kaiser by the resolution with which he upheld the interests of his own country. In his own King he always found a steadfast and admiring friend.

It was only in his latter years that he began to design and build rigid airships on the principle which will always be connected with his name. In this pursuit his engineering abilities, his love of adventure, and his great tenacity of purpose found full play. He had to face two main problems, the one engineering and the other financial. He put nearly the whole of his private fortune into his experiments, and when that was exhausted he proved himself to be one of the most pertinacious of successful beggars of modern times, as success began to shine upon

* Count Zeppelin: A Biography. By Margaret Goldsmith (London: Jonathan Cape). Obtainable from FLIGHT office. Price 8s. post free.

his efforts. He became the darling of the German people and a favourite of the Kaiser. Success never turned his head, and he remained to the end a youthful, sanguine, and ingenious character.

The British public may be obliged to the authoress of this book for giving this outline of a very interesting career. Weight is also lent to the book by a thoughtful foreword from the pen of Dr. Hugo Eckener, in which he pleads that the British public should not condemn the principle of airships because of the disastrous loss of gas on R.101. Both the authoress and Dr. Eckener, however, seem to claim that Count Zeppelin was not merely an eminent inventor and an interesting personality, but actually deserved the title "great." This claim is based rather on his general character and abilities than on his specific invention of the rigid airship. The claim is interesting, for it suggests that for the greater part of his long life he was a "mute, inglorious Milton." Grey used that expression of a villager. Ferdinand von Zeppelin was a rich noble, favoured by kings, and given numerous opportunities to distinguish himself. That he possessed considerable abilities is obvious; but that they never brought him into world-wide prominence until late in life is somewhat of a mystery.

This mystery is increased by the fact that, whereas Dr. Eckener is a convinced believer in the utility of the rigid airship, the authoress of the book seems almost sceptical upon that subject. Her scepticism does not carry much weight, because she evidently knows comparatively little about airships, and does not give due credit to the services which they undoubtedly rendered to the German Fleet. If, then, she doubts the greatness of Count Zeppelin's one gift to the world, how does she come to find greatness in the man himself? It may be a case of a biographer being carried away by worship of her hero. Such cases are common enough. That she has not proved him to be a great man may be due to her own limitations as a biographer. The book, in fact, is not a great work. It is, none the less, a readable book, fascinating in parts, which must attract readers by reason of the interest which the war forced everyone to take in the name Zeppelin.

F. A. DE V. R.

IN PARLIAMENT

Civil Aviation

MR. BENN, on June 29, in reply to Lt.-Com. Kenworthy, Major Graham Pole, and Capt. Peter Macdonald, said, I have received the following telegram from the Government of India:—

"The policy of operating a State air service across India has been referred to the Retrenchment Committee which may be expected to report in 3 or 4 months. In the meantime, all action in connection with the State air service has been suspended, except that the construction of aircraft, for which orders have been already placed, will proceed. No decision has yet been taken with regard to wireless and meteorological organisation. With the question of the State air service will have to be considered that of reducing expenditure on the ground organisation, including the possible closing of wireless and meteorological stations. Investigations in this connection are now in progress. The stations required for the Karachi-Delhi chartered service will be maintained until the expiry of the charter agreement. The organisation at Karachi will be maintained for the operation of the England-India service. The Imperial Airway Service to India will not be affected. No alternative for the operation of an air service east of Karachi has been considered."

I have no further information, and cannot say to what extent the work of raising the level of the landing ground at Juhu, Bombay, will be affected. The Government of India are of opinion that in the present state of their finances they cannot spend more on civil aviation during the current year than is strictly necessary. I should make it perfectly plain that the first object of the Government of India is a stable financial position.

Australia and Air Services

MR. MONTAGUE, in reply to Mr. A. M. Samuel, said the net cost to the British Exchequer of the two experimental air mail flights to and from Australia is the amount of the subsidy to Imperial Airways, which is approximately £8,000. As regards receipts, the sums due to the various companies concerned, including Imperial Airways, in respect of postal traffic carried amount to approximately £3,600. It would, however, be unwise to draw any deductions from these figures. On the question of a regular service, the flights have certainly shown that a regular service is technically feasible.

West Riding Aerodromes

MR. MONTAGUE, on July 1, in reply to Mr. Louis Smith, said there is one permanent civil aerodrome licensed for public use in the West Riding of Yorkshire; this is at Sherburn-in-Elmet. The provision of additional aerodromes would certainly be in the best interests of civil aviation, and in October, 1928, municipal authorities throughout the country, including Sheffield, were circularised in this sense. The Corporation of Sheffield have

had the matter under active consideration, and, at their request, one or two possible sites in the neighbourhood have been inspected by the Air Ministry. I hope that the result may be the provision of an aerodrome at Sheffield.

Women's Auxiliary Force, Miss Douglas-Pennant

MR. W. J. BROWN, on July 9, asked the Prime Minister whether he has considered the request made to him that he should receive a deputation with regard to Miss Douglas-Pennant's dismissal from the Women's Royal Auxiliary Force; and whether he proposes to receive the deputation?

MR. P. SNOWDEN: The answer to the first part of the question is in the affirmative. The Prime Minister has proposed to the chairman of the meeting from which a request for a deputation came that he, with the solicitor who is said to have new facts in his possession, should, with any others, see the Attorney-General who will in due course report to him the results.

MR. BROWN: Is it not the fact that the Attorney-General's power to produce a statement upon this case is entirely destroyed by the over-riding obligation laid down by the Prime Minister that any settlement must have the prior consent of Lord Weir, and that as long as that provision remains there is no hope of a settlement?

MR. SNOWDEN: There are a number of statements in the hon. Member's supplementary question which could not be substantiated.

MR. BROWN: Would the Chancellor of the Exchequer mind saying which statements cannot be substantiated?

Public School Cadets and Flying

CAPTAIN BALFOUR, on July 13, asked the Secretary of State for War if any alterations had been made for this year in respect of the regulations in force during the past few years allowing public school cadets taking part in the Officers Training Corps summer training camps to fly in aircraft of the Royal Air Force; and, if so, what reasons.

MR. T. SHAW.—Yes. Flying has no relation to, nor part in, the training of the Officers Training Corps, and experience has shown that the practice in the past, of granting special facilities for casual flights on the part of cadets during their summer camp, is deprecated by many of the parents. The majority of parents undoubtedly prefer that these flights should not be associated with training in the Junior Officers Training Corps, and, after full consideration, it has been decided that this practice shall be discontinued.

SIR S. HOARE asked if any opinions had been received from the headmasters of the schools concerned, and whether he was aware that no boy was allowed to fly without the special permission of his parents. Did not that dispose entirely of the answer given?

MR. SHAW said he was not aware of the facts mentioned. Action had been taken solely on the expert advice of men who knew the subject infinitely better than he did himself. He was willing to inquire into the points raised if it were possible that a mistake had been made.

THE ROYAL AIR FORCE

London Gazette, July 14, 1931

General Duties Branch

The following Pilot Officers on probation are confirmed in rank:—L. A. Bullard (April 11); T. J. MacInerney (May 20); J. W. Bateman, R. B. Brown, G. J. S. Chatterton, M. V. M. Clube, A. R. Collins, C. W. W. S. Conway, E. J. Gracie, R. G. Harman, W. E. Hooper, A. J. McDougall, H. W. Mermagen, J. B. S. Monypenny, D. G. Morris, G. N. Snarey, G. G. Stead, L. E. B. Stonhill, N. C. M. Styche, and M. R. D. Trewby (June 27).

Flight-Lieut. (since promoted) C. W. Hill, Half-pay List, Scale B, is transferred to Scale A, with effect from April 19, and is restored to full pay with effect from April 22. (Substituted for *Gazette*, May 5.)

The following Flying Officers are transferred to the Reserve, Class A:—H. B. Collins, R. C. Greenhalgh, R. G. Hennessy, D.S.O., M.C. (Major, Border Regt., R.A.R.O.), W. T. Walton (July 14); K. C. T. Marshall (July 15).

The short service commns. of the following Pilot Officers on probation are terminated on cessation of duty (July 15):—H. Bottomley, A. C. Griffiths, J. Meares.

Medical Branch

C. M. Fraser, M.B., Ch.B., is granted a short service commn. as Flying Officer for three years on Active List, with effect from and with seny, of June 30.

Chaplains Branch

The Rev. R. D. Grange-Bennett is granted a short service commn. as Chaplain (Church of England), with relative rank of Squadron-Leader (July 2).

RESERVE OF AIR FORCE OFFICERS

General Duties Branch

R. W. M. Hall is granted a commn. in Class A as a Flight-Lieutenant (July 14).

The following are granted commns. in Class AA (ii) as Pilot Officers on probation:—C. E. Powell (June 25); C. B. Houlder, T. P. de Paravicini, G. E. T. Scrase (June 29); H. C. Beaumont (July 1); A. B. Tucker (July 2).

R. H. Watson is granted a commn. in Special Reserve as a Pilot Officer on probation (June 9). The following Pilot Officers on probation are confirmed in rank:—J. A. Champness (June 19); R. S. Gleadow (July 1); W. L. Garstang (July 2); J. H. Edge (July 3); S. T. R. Hemsted (July 7); E. E. Cowrick (July 8).

The following Pilot Officers are promoted to rank of Flying Officer:—A. G. Douglas (May 16); M. J. Creswell (June 11).

Flying Officer L. P. Hirsh is transferred from Class B to Class C (Dec. 1, 1930). Flying Officer D. C. Bain relinquishes his commn. on completion of service (May 15). *Gazette*, April 21, concerning Flying Officer D. S. Purnell is cancelled.

Medical Branch

Flight-Lieut. T. M. Walker, M.R.C.S., L.R.C.P., is employed with Regular Air Force for a further year (June 2).

AUXILIARY AIR FORCE

General Duties Branch

No. 603 (CITY OF EDINBURGH) (BOMBER) SQUADRON.—Pilot Officer R. I. Kynaston resigns his commn. (March 9, 1930).

THE ROYAL AIR FORCE MEMORIAL FUND

The third meeting of the Executive Committee of the Fund was held at Iddesleigh House on July 1. Sir Charles McLeod was in the chair, and there was a full attendance of members. The usual financial statements were made by the Honorary Treasurer. The committee were informed that since the last meeting of the Executive Committee, on May 6, the Grants Sub-Committee and the Secretary had dealt with 163 cases of appeals for help, and that the sum of £1,715 15s. 3d. had been disbursed in grants to all ranks, past and present. The Executive Committee authorised a grant of money being made to the funds of the National Institute for Blind Ex-Servicemen. Mrs. F. V. Holt, widow of the late Air Vice-Marshal F. V. Holt, who is already a member of the Vanbrugh Castle School Sub-Committee, was unanimously elected a member of the Executive Committee.

The usual meeting of the Grants Sub-Committee of the Fund was held on July 9. Mr. W. S. Field was in the chair, and the other members of the Committee present were:—Mrs. L. M. K. Pratt Barlow, Air Commodore B. C. H. Drew. The Committee considered in all 16 cases, and made grants to the amount of £398 2s. 9d.

ROYAL AIR FORCE AWARDS

The following awards to personnel of the Royal Air Force in recognition of gallant and distinguished conduct in operations have been approved.

(i) Kordofan Province of the Sudan during the period December 16, 1929, to January 4, 1930. (*London Gazette* of June 26, 1931):—

Distinguished Flying Cross.—Flt.-Lieut. Willett Amalric Bowen Bowen-Buscarlet.

Mentioned in Despatches.—Leading Aircraftman F. I. Clemow. Sergt. H. Walters.

(ii) North-West Frontier of India between April 23 and September 12, 1930. (*London Gazette* of June 26, 1931):—

Order of the Bath (Military Division), C.B.—Group Captain (now Air Commodore) Henry Le Marchant Brock, D.S.O.

Order of the British Empire (Military Division), C.B.E.—Wing Commander Charles Curtis Darley, A.M.

O.B.E.—Squad.-Ldr. Roger Henry Gartside Neville, M.C. Squad.-Ldr. Leslie Norman Hollinghurst, D.F.C.

M.B.E.—Flying Officer Edward George Northway. Sergt.-Major, 1st Class, William Danton Coleman.

Bar to the Distinguished Flying Cross.—Squad.-Ldr. Philip Hildersley Cummings, D.F.C. Squad.-Ldr. Oliver Campbell Bryson, M.C., D.F.C., A.M. Squad.-Ldr. Stafford Berkeley Harris, D.F.C., A.F.C.

Distinguished Flying Cross.—Flt.-Lieut. Charles Ronald Hancock. Flt.-Lieut. Stephen McKeever. Flying Officer Geoffrey William Monk.

Distinguished Flying Medal.—Sergt. Richard Alexander Robert Falconer. Sergt. James Edward Wren (since deceased). Sergt. Frank Arthur Robinson.

Corpl. John George Lewis. Ldg. Aircraftman (now Corpl.) Robert William Ellis. Ldg. Aircraftman James Anthony Dwyer.

Mentioned in Despatches.—Wing Commander J. O. Archer, C.B.E. Flt.-Lieut. I. A. Bertram. Flt.-Lieut. C. N. H. Binley. Flying Officer H. Broadhurst. Squad.-Ldr. L. O. Brown, D.S.C., A.F.C. Wing Commd.

H. V. Champion de Crespigny, M.C., D.F.C. Flt.-Lieut. (now Squad.-Ldr.) W. F. Dickson, D.S.O., A.F.C. Flt.-Lieut. C. Feather. Flying Officer S. H. C. Gray. Flt.-Lieut. F. F. W. Hall. Flying Officer G. H. G. S. Jenkins.

Flying Officer (now Flt.-Lieut.) J. R. Jones. Flt.-Lieut. E. C. de V. Lart. Flt.-Lieut. C. L. Lea-Cox. Flt.-Lieut. A. H. H. MacDonald. Flying Officer A. McKee. Flt.-Lieut. F. G. A. Robinson. Flying Officer (now Flt.-Lieut.) H. D. Spreckley. Flying Officer A. Wall. Sergt. T. H. Addis. Ldg. Aircraftman E. Attwell. Ldg. Aircraftman (now Corporal) A. W. B. Barrett.

Sgt.-Maj., 1st Class (now Flying Officer), J. T. Brown. Ldg. Aircraftman (now Corp.) S. A. Clarke. Ldg. Aircraftman R. E. Douglas. Corp. J. W. Easton. Ldg. Aircraftman (now Corp.) H. E. Grellis. Ldg. Aircraftman J. G. Hales. Flight-Sergt. R. W. Hancock. Sergt. H. A. Harrison. Sergt.-Maj., 2nd Class, G. H. Hatch. Corp. S. J. Hatter. Sergt. C. Howells.

Sergt. H. Jones. Sergt. J. R. Kettley. Ldg. Aircraftman (now Corp.) A. W. Lee. Ldg. Aircraftman E. G. Legg. Ldg. Aircraftman C. H. R. McNally. Corp. D. Meredith. Corp. H. A. Oldfield. Sergt. J. Payne. Ldg. Aircraftman J. W. G. Reader. Aircraftman, 1st Class,

J. T. Rootes. Ldg. Aircraftman C. Smith. Ldg. Aircraftman A. C.

Spooner. Ldg. Aircraftman L. J. Strevens. Ldg. Aircraftman W. L. Townsend. Corp. W. A. Wargent. Corpl. C. S. Wiltshire (since deceased). Flt.-Sergt. G. E. H. Wooltorton.

(iii) Iraq during March and April, 1931. (*London Gazette* of June 23, 1931):—

Distinguished Service Order.—Squad.-Ldr. George Cecil Gardiner, D.F.C. *Distinguished Flying Cross*.—Flying Officer Sidney Joseph Horace Carr.

Attachment of Foreign Officers to the Royal Air Force

LIEUTENANT NAMORADO and Lieutenant Costa Gomes, of the Portuguese Naval Air Service, will be attached to No. 100 Squad., Donibristle, from July 1 to 31, to study the work and organisation of the squadron, and from August 1 to September 30, will be similarly attached to the Royal Air Force station at Mount Batten.

Aircraft Navigators' Examination—Successful Candidates

The Air Ministry announces:—The following candidates, whose names are given in alphabetical order, have passed the examination for Second Class Civil Aircraft Navigators' Licences, held at the Air Ministry on June 29 and 30 and July 1, 1931:—Sgt. C. A. Baker, R.A.F.; Flying Officer J. H. Barringer, R.A.F.O.; Flight-Lieut. W. N. Cumming, R.A.F.O.; Mr. J. B. Donald; Mr. V. E. Flowerday; Sgt. C. F. French, R.A.F.; Sgt. P. C. Ginn, R.A.F.; Mr. R. V. Griffin; Sgt. N. W. Nicholls, R.A.F.; Sgt. R. Pierce, R.A.F.; Flight-Lieut. E. H. D. Spence, R.A.F.O.; L.A.C. J. D. Wilkinson, R.A.F.; Sgt. A. L. Woode, R.A.F.

The subjects of the examination were: international legislation; form of the earth, maps and charts; meteorology; dead reckoning and direction finding W/T navigation; magnetism and compasses; visual signalling, Morse flashing, semaphore and international procedure.

Twenty-four candidates sat for the examination. To qualify, candidates were required to obtain not less than 70 per cent. of the aggregate marks with the exception of visual signalling, and not less than 60 per cent. in any one subject excluding visual signalling, in which subject not less than 90 per cent. was required in order to qualify.

The next examination will be held on October 5, 6 and 7, 1931.

Vacancies for Royal Air Force Apprentice Clerks

The Air Ministry announces:—Vacancies exist in the Royal Air Force for well-educated boys, between the ages of 15½ and 17, to enter as apprentice clerks in October and January next. The appointments will be made partly by the direct entry of boys who have obtained an approved school certificate, and partly by means of open competitions which will be held by the Civil Service Commission in October at various centres.*

Detailed information regarding the apprentice clerk scheme can be obtained from the Secretary, Air Ministry (Apprentice Clerks' Department), Gwydyr House, Whitehall, S.W.1. Successful candidates will be required to complete, in addition to the training period, 12 years' Regular Air Force service after reaching the age of 18. At the age of 30 they may return to civil life or may, upon attaining non-commissioned officer rank and subject to Service requirements, be permitted to re-engage to complete time for pension.

Boys entered under this scheme undergo a two years' course of training in clerical duties, typewriting, shorthand, bookkeeping and practical office routine, during which time their general education is continued under a staff of graduate teachers.

The apprentice clerks are paid 1s. a day for the first year and 1s. 6d. a day afterwards. The subsequent commencing rates of pay, at present varying from 3s. to 4s. 6d. a day (21s. to 31s. 6d. a week), depend upon the degree of success they achieve at their final examination. In addition, they receive free board and lodging and a uniform allowance.

* The open competition is conducted by the Civil Service Commissioners at the following centres: London, Belfast, Edinburgh, Plymouth, Birmingham, Chatham, Cardiff, Portsmouth.

R.A.F. Re-equipment

CONCURRENTLY with its re-equipment with Fairey Gordon aircraft (with Panther engines), No. 6 Squadron of the R.A.F. at Ismailia is changing over from Army co-operation to bomber duties. This squadron was moved from Iraq to Egypt in 1929. Except for two squadrons in India whose re-equipment has been delayed, it is the last unit of the R.A.F. to have the Bristol fighter machine, the last of war-time design to be found in squadrons. No. 6 Squadron is commanded by Squad.-Ldr. John P. Coleman, A.F.C., who joined it in January last after being Command Examining Officer at Uxbridge.

FROM THE EMERALD ISLE

Ireland Gets Going

GREAT excitement reigns in Irish flying circles at the moment following the announcement that the Minister for Industry and Commerce proposes to make a grant of £1,000 to the Irish Aero Club for the furtherance of Irish aviation. It is understood that the matter will have the immediate attention of the Dail and that it will go through without difficulty. The Club are not yet certain as to whether they are dreaming or who the fairy godmother is, but they are certainly talking of standardising the Gipsy Moth (wooden) as the training machines for the future. The Irish Aviation Company has suddenly sprung into being and started work with great rapidity and little publicity. Collinstown aerodrome has been taken over by the company and a Desoutter roosts quietly (at times) under a dry spot in one of the derelict hangars. Captain Eric Stewart, M.C., is the chief pilot and the first of work that the company has done is to transport the *Daily Mail* from Dublin to Sligo in order that the edition printed in Manchester shall arrive before the Irish papers printed in Dublin. The service is, at the moment, an experimental one, but there is every prospect of a contract being made. Sligo was chosen for the experiment as the conditions are the worst anywhere in Ireland, local mists, strong westerly winds off the Atlantic and alternate patches of mountain and bog country. Our representative accompanied Captain Stewart on the second trip with the newspapers, which were collected from the steamer at Dun Laoghaire at 6 a.m. and whisked off to Collinstown; by 6.55 the machine was in the air and delivery was effected at Sligo by 8.15, the distance being 110 miles, approximately. His comments on the journey were:—"Good possibilities for a tourist service as the aeroplane can beat the railway by two or three hours on the journey, which can be accomplished at a cheap rate as there will be a fair amount of traffic, as Sligo serves a very large proportion of the West Coast towns, especially County Donegal." The company announce that it is their intention to concentrate on internal services, principally charter work. Iona National Airways, Ltd., also report good progress with pupils and joy-riding, which is proving particularly profitable in Ireland at the present time. On returning after joy-rides in the Western district on July 9 one of the machines argued with a haycock—that's the worst of an agricultural country—and turned turtle; it is believed the pilot received nothing worse than a black eye. A company calling itself the Galway Trans-Atlantic Company, Ltd., has been formed and proposes to establish Galway as the trans-Atlantic port of the future, and has included in its programme the establishment of an aerodrome on a site near the harbour. It will be remembered that a year or so ago Colonel Charles Russell flew mails from Galway to London, but nothing more came of the enterprise—but Ireland was not so airminded in those days as she has become recently.

Irish Aero Club "At Home"

THE Irish Aero Club will hold their first "At Home" at Baldonnel Aerodrome, County Dublin, on August 15 next. Several competitions and races will be held in addition to all the usual display items. Invitations are extended to all English pilots and machines to visit the club during the week-end of the "At Home"; intending visitors should notify the secretary of the club at the address given in the advertisement on page xxviii.

Irish Free State Notice to Airmen

THE Department of Industry and Commerce has issued a Civil Aviation Notice (No. 1 of 1931) requesting pilots to avoid flying over, or in the vicinity of, the Royal Dublin Society's premises at Ballsbridge, County Dublin, during the period of the Horse Show, August 4—7. The premises are situated 2 miles S.E. of the centre of the City of Dublin and $4\frac{1}{2}$ miles W.N.W. of Dun Laoghaire (Kings-town). They are easily recognisable from a distance by the large galvanised-iron roofs of the stands surrounding the jumping enclosure and by an open space adjoining the premises on the west side.

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Standard Telephones and Cables, Ltd.

WE understand that Capt. Duncan Sinclair—who will, no doubt, be well known to many of our readers in connection with the wireless side of aviation—has taken charge of the Aviation Division of Standard Telephones and Cables, Ltd., of Columbia House, Aldwych, W.C.2, and some interesting information will shortly be forthcoming regarding the aerial activity of this well-known electrical firm.

PUBLICATIONS RECEIVED

Aeronautical Research Committee Reports and Memoranda: No. 1361. Carburettor Fuel Metering Characteristics. By W. C. Clothier. December, 1930. H.M. Stationery Office, Kingsway, London, W.C.2. Price 9d. net.

Book of the Autogiro. By C. J. Sanders and A. H. Rawson. London: Sir Isaac Pitman and Sons, Ltd. Price 5s. net.

Vickers and Associated Companies' News. April, 1931. Vol. 7. No. 82. Vickers House, Broadway, Westminster, S.W.1. Price 2d.; post free, 8d.

The Advantages of Chromidium Cylinder Iron. The Midland Motor Cylinder Co., Ltd., Birmid Works, Smethwick, near Birmingham.

Apia Observatory Report for 1927. W. A. G. Skinner, Government Printer, Wellington, New Zealand.

Aeronautical Research Committee Reports and Memoranda: No. 1362 (E.44-I.C.E. 782). Detonation, Mineral Lubricating Oils and Blended Fuels. By R. O. King and H. Moss. July, 1930. Price 9d. net. No. 1367 (Ae.494-T.3022). *Longitudinal Control and Stability when Stalled.* By E. T. Jones and R. P. Alston. September, 1930. Price 9d. net. H.M. Stationery Office, Kingsway, London, W.C.2.

Cross-Country Flying. By Major Oliver Stewart, M.C., A.F.C. London: Constable & Co., Ltd. Price 6s. net.

Report of the Federation of British Industries Mission to Canada. May, 1931. Federation of British Industries, 21, Tothill Street, London, S.W.1.

"Bristol" Steel Aircraft Construction. The Bristol Aeroplane Co., Ltd., Filton, Bristol.

Jump! By Don Glassman. New York: Simon & Schuster. London: J. W. Arrowsmith (London), Ltd. Price 10s. 6d.

Count Zeppelin. By Margaret Goldsmith. A Biography with a Foreword by Dr. Hugo Eckener. London: Jonathan Cape, Ltd. Price 7s. 6d. net.

Aeronautical Research Committee Reports and Memoranda. No. 1344. The Fluence of a Fuselage on the Lift of a Monoplane. By A. S. Hartshorn. May, 1930. Price 9d. net. No. 1359. *Heat Transmission Between Surfaces and Fluids Flowing over Them. (1) The Case of Two-Dimensional Flow.* By W. F. Cope. October, 1930. Price 6d. net. No. 1365. *The Limits of Compression Ratio in Diesel Engines.* By D. R. Pye. November, 1930. Price 9d. net. No. 1366. *Drag and Heat Dissipation of Three Radiator Systems.* By E. T. Jones. August, 1930. Price 1s. net. No. 1368. *Flow of Air Adjacent to the Surface of a Rotating Cylinder in a Stream.* By E. G. Richardson. December, 1930. Price 1s. net. No. 1370. *Drag of Circular Cylinders and Spheres.* By A. Fage. May, 1930. Price 6d. net. No. 1373. *Eddies Behind of Circular Cylinders.* By A. Thom. December, 1930. Price 6d. net. H.M. Stationery Office, Kingsway, London, W.C.2.

Flieger im Westen. By Haupt Heydemarck. William Kolk, Wilhelmstr. 8, Berlin, S.W.48. Price M.3.50 and M.4.20.

Aerial and Marine Navigation Tables. By John E. Gingrich. London: McGraw-Hill Publishing Co., Ltd. Price 12s. 6d. net.

FLIGHT, The Aircraft Engineer and Airships.

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